

The Principality of Monaco is traditionally a privileged land of hospitality for medical, paramedical and pharmaceutical conventions, as well as other international meetings, scientific or not.

This success can easily be explained: Monaco is readily accessible from anywhere in the world; Monaco is a neutral country whose reputation for security is well established;



Monaco offers enviable hotel and convention facilities on a rather small perimeter. All this helps promote contacts. In addition to these factors there are the Monegasque authorities' policy of providing exceptionally fine hospitality and the services offered by Monaco Meetings. The

Monaco Tourist Authority has always worked tirelessly to facilitate preparation and stays in the Principality for organizers and convention goers, and fully intends to do even more in the future than in the past. We are also fortunate in that Monaco, thanks to its Sovereign Princes' policy, can offer health and medical infrastructures with several world-renowned private and public establishments.

Monaco has attracted top-notch medical personalities. Many participate in conventions all over the world, others organize them. All these physicians are obviously ready, each in their own speciality, to contribute to making Monaco an even more popular venue for medical conventions at a time when the Principality is about to develop its research activity even further and build a new hospital.

Michel Bouquier

President

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MONACO, A PRIVILEGED VENUE FOR MEDICAL CONVENTIONS



BIENNALE DE CANCÉROLOGIE

The Principality of Monaco's health and medical infrastructures is widely reputed for the quality of its staff and high-level facilities in many speciality areas. It has also set up a policy of cooperation and networking with hospitals in neighbouring France, whenever necessary for the sake of complementariness and efficacy.

Thanks to the health and medical infrastructures renown and the Principality's appeal (ease of access, accommodation, convention centres, availability of specialized organizing teams), Monaco has been a privileged venue for medical conventions, as well as paramedical, pharmaceutical and cosmetics meetings for many years. They represent approximately one-fifth of all events, for all areas taken together.

Medical conventions have a special place, whether they are organized on the initiative of physicians practising in Monaco or organizers of national, European or even international conventions who select the Principality as their venue, as very often happens. It is impossible to be exhaustive and mention them all, since the list would be far too long, and it is useless to go too far back in time, since this would be tedious. Nonetheless, here are a few illustrative examples.

This is true for the *Biennale de Cancérologie*, whose scientific committee is chaired by Dr Moïse Namer and Dr Michel Héry, head of Radiotherapy at the CHPG. It was held for the eighth time in January 2008 at the Grimaldi Forum for four days. Another initiative is represented by *Monaco Age Oncologie*, held for the second time in early 2009 (right). Moreover, in June 2007, Dr Michel-Yves Mourou, Head of the Medical Imaging Department at the CHPG, chaired a convention on 'Practising mastology'. The *16th Annual Meeting of the European Association for Cardiothoracic Surgery* was also held in the Principality in 2002, on the initiative of Professor Vincent Dor and Dr Jean-Joseph Pastor. For *Cardiostim*, born in Monaco twenty years ago, Professor Nadir Saoudi and his staff are as active as ever.

Many medical personalities from Monaco are at the origin of, or participate in, meetings in the Principality, each in their own

specialities. We should note the initiative taken in autumn 2007 by Professor Patrick Rampal: the live broadcast of colonoscopies during a meeting in Boston.

The Principality's ties with sport also inspired the organization of specialized medical conventions, like Dr Patrick Coudert's *Journée Médicale du Tennis*. In November 2007, there was the first *Biennale de Monaco on Physical Activity and Health*, the result of an association between the Principality and the International Olympic Committee, organized by Publi-Créations, like many meetings in Monaco.

Thanks to its assets and experience, Monaco has been hosting international medical conventions in all disciplines for many years. As we said, it is impossible to list them all: meeting of the European Society of Paediatric Neurology organized in 2005 by Professor Philippe Évrard; colloquium on dental implants with the European Association of Osseointegration held in Warsaw in 2008 which should draw nearly 3,000 participants to Monaco in October 2009. In April 2008, Professor Robert Giuli organized the OESO Congress in Monaco (see page 4). The *19th World Congress of Asthma*, in November 2008, attracted 2,500 participants from all continents. Another very international meeting will take place in September 2009: the *16th World Meeting of the International Union of Phlebology*, for its fiftieth anniversary (see page 5: text by Dr Jean-Jérôme Guex).

Monaco continues to be as attractive... for its own people and for others, too, because the Principality is so appealing - true, no one will dispute that - but also because it is ideal for working efficiently. All those who have organized or participated in conventions emphasize the fact that staff is always at their disposal, which helps them avoid hassle and waste of time, and conditions are optimum. After the meetings, it is possible to meet easily and rapidly to pursue discussions and debate various issues. For many people, Monaco is the ideal venue and their only regret is the rule enforced by many associations requiring them to change cities or countries every year.



GRIMALDI FORUM



The *Biennale Monegasque de Cancérologie* has become a genuine institution over the years. It is likely one of the best examples of what the Principality is capable of achieving in the way of medical conventions and loyalty among participants: 120 for the first meeting in 1994; no less than 1,400 attending the eighth event, held in February 2008.

Its scientific committee is chaired by Dr Moïse Namer and Dr Michel Héry, Head of the Radiotherapy Department at the CHPG. *"This is a major congress from a scientific standpoint, with remarkable speakers, where people exchange a great deal of information, explains Michel Héry. For all those attending the meeting, it is a great crossroads of information and knowledge. The convivial atmosphere generated by Monaco helps provide an extension of the formal convention through smaller meetings outside the Grimaldi Forum. These satellite meetings are useful for clinical researchers."* Dr Michel Héry never tires of praising the services offered by the Grimaldi Forum and appreciates the hospitality and value for money in Monaco's hotels.

Although the *Biennale Monegasque* does not have the dimension of the congress organized by the American Society of Clinical Oncology, it is the largest French-language event in cancer research. Michel Héry has been able to rely on this to organize *Monaco Age Oncologie*, held again in February 2009 at the *Hôtel Méridien Beach Plaza's Sea Club*. The idea underlying MAO is to bring together oncologists and gerontologists to study and improve overall treatment of cancer patients. Dr Michel Héry emphasizes that age created specific conditions and that, all too often, elderly patients do not benefit from the same precautions as younger people, especially from a psychological standpoint.

MONACO, A PRIVILEGED VENUE FOR MEDICAL CONVENTIONS



OESO WORLD CONGRESS

Professor Robert Giuli organized the OESO Conference in Monaco in April 2008.

OESO (World Organization for Specialized Studies on Diseases of the Esophagus) is an association he founded, grouping the best specialists in all the disciplines (19) involved in problems of the upper digestive tract in 85 countries. The first conventions were held in Paris at UNESCO headquarters, whose member countries approved an exceptional resolution in 1999 emphasizing the interest of cooperating with OESO for innovative organizations in all countries in the world of systems of research and care through coordination that leads to efficiency and equality. This resolution was submitted at the time by France and Monaco.

Searching for venues other than Paris, Professor Robert Giuli first chose the town of Avignon, a UNESCO World Heritage Site, then Monaco. This was quite logical since he is personally very attached to Roquebrune-Cap-Martin and Monaco where he spent part of his youth.

"The openness and efficiency of the Monaco Tourist Authority and Grimaldi Forum staff, as well as the hotel facilities are all factors that convinced me once and for all to select Monaco," he explains. This positive assessment has been further reinforced over time. The 9th World OESO Congress, held from 6 to 9 April 2008, attracted over a thousand specialists from 65 different countries. Professor Robert Giuli has nothing but praise for the hospitality he has always enjoyed in the Principality, as with the Grimaldi Forum staff, including the technical department, which developed an innovative timing system visible to the speaker, the moderator and the audience. It is very practical, since one of the principles of the Congress, specific to OESO, was for the world's finest specialists to answer a long series of questions in just 300 seconds. Moreover, Professor Giuli recalls that the American Medical Association awarded credit for 27 units of continuing medical education to

the OESO Congress, which is exceptional. He also underscores the importance of the contribution of his friend, Professor Patrick Rampal, Head of the Hepatogastroenterology Department at the CHPG and former President of the Société Française de Gastro-entérologie.

Most of all, this 9th OESO Conference is the first to be honoured by the presence of a Head of State. Received by the Sovereign in a private audience before the Congress, Professor Robert Giuli was very satisfied by this opportunity to explain his actions in developing countries at the head of OESO as well as of his Foundation, dedicated to Continuing medical education in the exceptional context of a distance-learning chair granted to the OESO Foundation by UNESCO.





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INTERNATIONAL OSTEOLOGY SYMPOSIUM

The medical events scheduled in Monaco for 2009 include the *16th World Congress of the International Union of Phlebology*. This meeting, which groups thirty-six phlebology societies from all over the world, is held every four years in a major city in the world (the last four being Montreal, Sydney, Rome and Rio de Janeiro). Co-organized this time by the *Société Française de Phlébologie* and its German counterpart, the 2009 Congress coincides with the fiftieth anniversary of the creation of the Union. The association of two of these societies to organize a congress in Europe is a first and strong testimony to their will for unity and cooperation.

Why Monaco? *"The Principality of Monaco has a great deal to offer as a congress venue: climate, security, hotel facilities, remarkable convention centre, competent technical staff, activities. It is also a sort of neutral ground for a congress organized by two European societies,"* explains Dr Jean-Jérôme Guex, phlebologist in Nice and Organizing Committee chairman.

This congress, to be held at the Grimaldi Forum for five days (from 31 August to 4 September 2009), will draw 1,500 to 2,000 participants to discuss the latest research on venous disorders and their treatment. *"This is a particularly important event since chronic venous disorders (like varicose veins and varicose ulcers) as well as those that are acute (phlebitis and thromboembolic disease) affect or will affect nearly 40% of the adult population in the West,"* declares Professor Eberhard Rabe, chairman of the Scientific Committee.

The leaders of the speciality from all continents have already confirmed their presence in Monaco, recognizing that such an occasion is a 'must' for them. The organizers' intention to make this the best phlebology congress to date seems to be on the right track.

*Jean-Jérôme Guex, MD, FACPh,

Former president of the Société Française de Phlébologie, treasurer of the International Union of Phlebology and chairman of the UIP50 Monaco 2009 Organizing Committee



The Principality of Monaco's health policy

by Dr Jean-Joseph Pastor,

Chairman of the CHPG Board of Directors

One of government's priorities is a modern realistic vision of an irreproachable health policy. In this area, Monaco can be satisfied to have completely succeeded in meeting this challenge.

- The CHPG, a public hospital, handles all areas of prevention, medical care, care for the elderly and disabled, and health security. The construction of new hospitals in future years will perpetuate the sanitary programme; it will remain the Principality's main institutional player in the health care offering.
- The CCM (Centre Cardio-Thoracique de Monaco) is a private establishment, renowned beyond the Principality's borders.
- The IM2S (Institut Monégasque de Médecine et chirurgie Sportive) has been operational for several years now and is also expected to have a brilliant future.
- The CHPM (Centre d'hémodialyse privé de Monaco) has seen its activity progress constantly since it first opened.

This medical environment needs a window to the outside. This goes hand in hand with the organization of many medical conventions that enables the medico-surgical world to appreciate and realize how perfectly the Principality of Monaco controls health issues.

Cooperation of the medical corps with the Monaco Tourist Authority is one of the fundamental elements in this success.

MONACO: COORDINATED HUMANITARIAN ACTION



"I am convinced that Monaco can become a great power in its own way, combining a vision of the world turned towards progress and well-being with the implementation of activities for protecting the environment, fighting for peace, respecting justice and sustainable development, defending the underprivileged, implementing actions towards a more equitable and harmonious world." (From HSH Prince Albert II's coronation speech on 12 July 2005)

The Principality of Monaco's policy of aid for development and humanitarian action is exemplary for its scope and organization. In the area of humanitarian action, many members of the medical corps or paramedical auxiliaries participate in operations in the field, particularly in several African countries. It sends missions there and performs procedures in the Principality's hospitals (see below) especially in cardiology and orthopaedics. Prince Albert II and the Executive Committee decided to provide the Monaco Red Cross (MRC) with an international humanitarian section at the instigation and under the responsibility of Dr Michel-Yves Mourou, Administrator of the MRC and also in charge of the First Aid section.

In 2008, the Monegasque government pursued its action towards aid for development: this year, eighty-five projects will be undertaken in all in twenty partner countries. The DCI (Department of International Cooperation) actions are undertaken in close cooperation with local partners – technical ministries, municipalities, non-governmental organizations – for these populations' direct benefit. The DCI also relies on competencies available in the Principality to undertake such initiatives. To this end, the Principality's departments and institutions are very often mobilized to monitor and implement international aid projects.

Public aid for development in Monaco has grown considerably in recent years. At the instigation of HSH Prince Albert II, the government

is intensifying its efforts towards public aid for development to reach 0.7% of gross national product by 2015 at the latest.

Health and social sector

Since 2006, in particular, the Principality has devoted special attention to the area of maternal and infant health by building dispensaries in Niger, Mauritania and Madagascar. They have contributed to providing access to health care for an estimated 100,000 people.

The Principality also participates in programmes to fight pandemics in cooperation with the World Health Organization. Thus, in Niger, 100,000 children are vaccinated every year against polio and, in Madagascar, 20,000 people benefit from a programme for the prevention of malaria.

In such areas as accommodation, health care and the fight against malnutrition, Monegasque cooperation provides treatment for 1,500 children in Burkina Faso, Mali and Madagascar every year. Moreover, in South Africa, 200 children benefit from the construction of social childcare centres. Children and young people suffering from disabilities represent a priority for these programmes along with street children and orphans.

Prince Albert II supports Monaco Humanitaire

For the Sovereign Prince's fiftieth birthday, eighteen Monegasque NGOs and the DCI – under the name *Monaco Collectif Humanitaire* – submitted a project that aims to increase substantially the number of children treated in the Principality for pathologies for which they cannot receive treatment in their own countries. The partner hospitals are the Centre hospitalier Princesse Grace, the Centre Cardio-Thoracique de Monaco and the IM2S.



The Sovereign Prince decided to allocate all donations received at the time of his coronation - 560,000 - to this project, in addition to the 400,000 already collected. This initiative will enable a hundred children to receive treatment.

*Mission Enfance, APPO, Aide au Père Pedro Opeka, Monaco Aide & Présence, Association Mondiale des Amis de l'Enfance (AMADE), AMADE Monaco, AMREF-Monaco Flying Doctors, Association Monaco Asie, Act for Nature, Aide & Développement Sans Frontière, Les Amis du Liban, Association Amitié Sans Frontières, Caap Afrika, Children & Future, Monaco Red Cross, Fight AIDS Monaco (FAM), WFE Wings for Earth, Aviation without Frontiers, La Coopération Internationale

> Humanitarian action: the CHPG's involvement

For many years, the men and women working at the CHPG have been involved in humanitarian action. In 2006, a partnership on a financial level, as well as in terms of logistics and competencies, took shape between the CHPG, the Monegasque Departments of Foreign Relations and of Social and Health Affairs. Today, humanitarian initiatives mobilizing CHPG staff are listed and oriented to optimize aid.

Missions in 2007-2008

Orthopaedics in Niger (Dr Tristan Lascar)

- Actions: surgery of disabilities, paediatric surgery, microsurgery Hip and knee replacement, surgical treatment of bone malformations due to sickle-cell anaemia
- Key figures: 20 to 30 operations a year
- Related Association: Caap-Afrika

Radiotherapy in Madagascar (Dr Michel Héry)

- Action: improving radiotherapy in Madagascar
- Related Institution: International Atomic Energy Agency

Cardiology in Morocco (Dr Nadir Saoudi and Dr Naima Zarquane)

- Action: implanting pacemakers
- Key figures: 4 operations a year
- Related Association: Association de Cardiologie Monaco Maroc

Cardiology in Romania (Dr Philippe Ricard)

- Action: implanting cardiac defibrillators
- Key figures: 3 operations
- Related Association: Association Monégasque de Lutte contre la Mort Subite

Ophthalmology in Niger (Dr Jean-Marc Riss)

- Action: extension of the Ophthalmology Centre to create a hospitalization facility
 - Related Association: Monaco Aide & Présence
- Participation in the collective humanitarian project of Monegasque NGOs in 2008, receiving children for surgery in different specialities: cardiology, surgery, urology, orthopaedic surgery

Students from the IFSI of Monaco in Mali

Many nursing students express the wish to participate in humanitarian action before starting their careers.

Thus, in July 2008, nine second-year nursing students from the IFSI (Institut de Formation en Soins Infirmiers) of the Centre hospitalier Princesse Grace (CHPG) spent a fortnight in community medical centres in Mali, as part of an international aid programme between the Red Cross of Monaco and of Mali co-funded by the Bureau for International Cooperation.

In the course of this fortnight, they had to put into practice and transmit their knowledge while adapting to the local context in Mali. They were supervised by Laurence Charpentier, an IFSI healthcare trainer, and Dr Olivia Keita-Perse, head of the CHPG Epidemiology and Hospital Hygiene Department and a member of the Monegasque Red Cross international humanitarian section.

HUMANITARIAN ACTION IN THE FIELD



The purpose of this project was to improve hygiene-related practices in community medical centres. The experience provided considerable exchange of knowledge. On one hand, for Malian professionals: hand washing and decontamination of equipment are assets in the fight against nosocomial infections. On the other hand, for the nursing students: the development of a more sophisticated clinic, an irremediably broader vision of healthcare, better awareness of waste and more efficient use of equipment... and a sense of 'resourcefulness' that will serve them in their professional lives.

> Restoring hope

Interview with Dr Tristan Lascar

You've participated in missions to Africa for several years now. As an orthopaedic surgeon, you've performed operations on a certain number of young Africans. How did this vocation come to you and how do you reconcile this role with your activity at the CHPG?

Tristan Lascar : I was fortunate in having been trained by generous masters. The time had come for me to transmit what I had learned, which is always an enriching experience since you can properly teach only what you've completely assimilated. Turning towards others is also a way of better understanding oneself. My activity at the Centre hospitalier Princesse Grace is very compelling, both in patient relations and in clinical research, especially for shoulder surgery. Managing to find time for teaching and for surgical missions to Niger, while preserving my family life, does require proper organization.

Your action also involves several Monegasque organizations; does each one have a different mission? The name 'Caap Afrika' is in fact an acronym; how was it born?

T.L. : I participate in several so-called humanitarian organizations, especially the Monaco Red Cross, to which I am very grateful for having allowed me to participate in this human adventure, enabling me to undertake healthcare missions in Africa alongside an exceptional team of nurses and physicians. In parallel to these surgery missions during which we perform dozens of operations a week, we wanted to prolong such direct technical assistance through teaching, to place the project in the longer term. This example is a good illustration of the synergy that can exist between different NGOs with the same will to help that can take different forms, pooling energy and resources.

'Caap Afrika', *Cooperative Aura Abla Pokou Afrika* (an African princess who gave everything for her people), is an NGO whose main project at present is specialized training in orthopaedic surgery for students from Niger. These students are trained in the orthopaedic surgery unit at the Princess Grace Hospital and in other French teaching hospitals according to objectives selected for each student. My action in 'Caap Afrika' is above all coordinating teaching, even though working in a small NGO means doing lots of things in all areas...

I was by Alain Deloche's association to act as one of the links in this wonderful 'chain of hope' to perform surgery on children from all over the world. I must admit that I was deeply touched by this attention since I've always been impressed by this association's fabulous work. I guess I'll just have to find a little more time...

When one thinks of Africa, it isn't so much the needs in orthopaedics. Why is that? What are the most common pathologies?

T.L. : When you think of Africa, you usually think of famine, disease, poverty... But you have to remember that survival often entails a functional condition and acceptance of the way others see you. In this sense, performing a double-hip replacement for a young woman who can hardly walk means giving her a chance to work, marry,



DR TRISTAN LASCAR IN NIGER WITH THE MONACO RED CROSS TEAM



have children and simply live her life. It's also very important to be able to restore its function to the paralysed hand of a 35-year-old man who, in the prime of life, can no longer feed his family.

Etymologically, orthopaedic surgery means 'performing surgery to set children straight again.' The photographs are a good illustration of this definition. The most common pathologies in sub-Saharan Africa are surely the effects of sickle-cell anaemia. This disease causes deformation of red blood cells which accumulate in capillary vessels, leading to infarction of the organ downstream. This results in necrosis of femoral and humeral heads and articular damage.

We are presently in the preparatory phase of a vast clinical research project on sickle-cell disease in which the hospital of Monaco would serve as the point of convergence and reference for the different centres located in areas where the disease is endemic. Obviously, the sequelae of various forms of trauma and all sorts of malformations are legion in Africa, and could give work to the entire international surgical community for at least 20 years.

Our projects include training of surgeons, especially from Niger, in Monaco. In practice, how would this be done?

T.L. : We've already participated in training four students (the next one is scheduled for October 2008). These students are selected in Niger through an oral interview; they must be in their fourth year of internship in general surgery, which means they have validated their six years of medical training. This teaching takes the form of daily accompaniment – *"Let me teach you what I have learned"* – plus sessions with technical staff on different topics, according to the orientation chosen for the training (paediatric surgery, hip, knee, shoulder arthroplasty, arthroscopic surgery, plastic and reparatory surgery, surgery of the hand...). The originality of this training is that it aims to be as 'customized' as possible, while remaining applicable in the student's country, since it must be adapted to Niger's technological possibilities. Moreover, we try to maintain contact

with all the students through the Internet. This enables us to help them make the best decisions in difficult cases.

The Principality is very active in humanitarian medicine. Does it have the recognition it deserves? Wouldn't it be a good idea to have more initiatives involving several organizations, as on the Sovereign's birthday?

T.L. : I believe the Principality has always been involved in humanitarian aid. Through the many NGOs present here and their extraordinary work in the areas of health, education and sustainable development in the planet's most disadvantaged countries. What is more recent is that, at HSH Prince Albert II's instigation, the Department of Foreign Relations, especially the entire International Cooperation team, rationalizes, organizes and coordinates this generosity with great professionalism and highly motivating dynamism. Such coordination is essential for the realization of large-scale projects, since we all know there's strength in numbers, and there can never be too many people helping those who are most underprivileged. I'm convinced that Monaco, despite its small size, will play a considerable role in the organization of international aid, especially in the search for synergy within the world's biggest NGOs.

PREVENTION: A PRIORITY



In its health policy, the Principality of Monaco grants a special place to prevention and screening, without omitting education, even further upstream. A law banning smoking in public places was voted and became effective in November 2008, but it was widely anticipated. Children and teenagers are given specific information in educational institutions. In terms of prevention, Monaco is on the cutting edge in many areas, especially defibrillators and training the public to use them (see below).

The screening centre (*Centre de Dépistage*) is obviously responsible for HIV and hepatitis B and C; but diabetes, osteoporosis and cancer in all its forms are major concerns for the medical and sanitary authorities. This means breast and cervical cancer, with the 'ThinPrep Pap Test' for women; as well as prostate cancer for men, and colorectal cancer, which receive special attention.

> Colorectal cancer: indispensable prevention

Cancer of the colon and rectum is the most common form of cancer in Western countries for both sexes. One out of twenty-five people will be affected in his/her lifetime by this pathology. This cancer results from a precancerous lesion, the polyp, which becomes a malignant lesion after ten or twenty year of evolution, knowing that not all polyps become cancerous. This makes it possible to prevent the onset of cancer on condition of identifying polyps before they turn malignant.

Detecting blood in stool is a technique that helps screen for colorectal polyps in the process of degeneration. This is why Professor Patrick Rampal founded a screening centre for colorectal cancer in Monaco in 2005. Its purpose is to prevent this disease in members of the Monegasque Social Security Centre. Such screening is based on detection of blood in stool using the Hemoccult technique twice with all members of the Monegasque Social Security Centre

between the ages of 50 to 74. The manager of the screening centre for colorectal cancer, Dr Philippe Pasquier, explains that this public health campaign concerns some 15,000 people, but also involves an information and awareness campaign to this pathology for subjects outside the 'target' population, the purpose being to reduce this scourge in the population as a whole. In the target population for screening, information and incentives to participate in this initiative are ensured by GPs and occupational physicians.

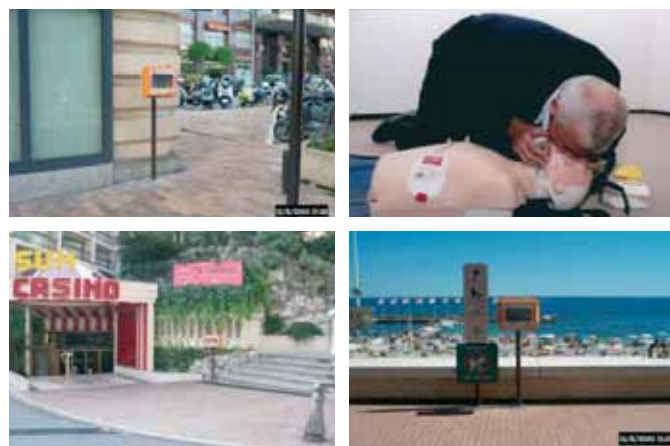
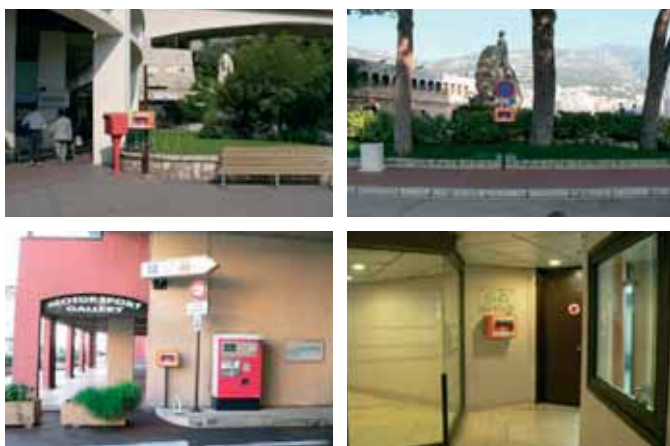
Of the subjects informed, those who are considered to be most at risk for colorectal pathology will be advised to undergo screening by colonoscopy (endoscopic or virtual). Subjects with only medium risk will be advised to perform the Hemoccult test every two years. If the test is positive, a colonoscopy should help detect the presence of a polyp, remove it and identify its nature.

The screening centre for colorectal cancer in the Centre Hospitalier Princesse Grace, in addition to consultations with Dr Daniel Rouison, provides technical information on the Hemoccult tests, information and advice on prevention that should soon lead to a significant decrease in the incidence of this pathology in the Principality.

> Fighting sudden death: defibrillators

Half of mortality due to cardiovascular problems is sudden. In France, the number of sudden deaths is estimated at 40,000 to 50,000. Ventricular fibrillation is a very serious disorder of the cardiac rhythm. It is caused by anarchical electrical activity of the heart, which results in lack of contraction of both ventricles. As a result, blood is no longer ejected to the vital organs, the brain in particular.

The fight against sudden death involves two main actions. The first is directly under the cardiologist's responsibility, the identification patients with a high risk for sudden death who can be protected by



implanting a defibrillator. The second concerns the organization of emergency care and actions towards the public at large.

Since cardiac arrest most often occurs in the home (over 70%), making cardiopulmonary resuscitation and early defibrillation more difficult, prevention in public places is primordial.

The three phases of heart failure

Heart failure has been divided into three phases: the first four minutes, from the fourth to the tenth minute, and beyond. In the first phase, immediate defibrillation is the most appropriate treatment. In the second, it is recommended that the vital organs, including the heart, be re-oxygenated by performing cardiopulmonary resuscitation to improve the efficacy of delayed defibrillation.

Obviously, the ideal situation is to be able to intervene in the first phase. Hence the idea that, independently of improving the organization of emergency aid, it is essential for witnesses to be able to begin resuscitation; since these are usually non-professionals, this means training a maximum number of people. This approach is all the more justified that the Principality is particularly well equipped with defibrillators.

Prince Rainier III had nine semi-automatic defibrillators installed in 2001 in places receiving very large numbers of people (shopping centres, heliport, beaches, convention centres, stadiums, hotels, Prince's Palace). They are meant to be handled by security staff and are not visible to the public.

Automatic diagnosis

Semi-automatic defibrillators offer the advantage of automatically performing electrocardiographic diagnosis. A computer-generated voice then issues the order to deliver a shock if ventricular

fibrillation has been diagnosed. All that has to be done is press the button. Moreover, no shocks may be delivered if the device has not diagnosed ventricular fibrillation.

In 2003, Professor Saoudi founded the Monegasque Association to Fight Sudden Death. Prince Albert II is the Association's Honorary Chairman; today it is chaired by Dr Philippe Ricard. In October 2005, other semi-automatic defibrillators have been installed in the streets of the Principality. They are kept in a recognizable orange box, closed with a seal. Many Monegasque people, institutions and associations are involved in this initiative.

Training the public

The Emergency Department is associated with this action and is equipped to retrieve the traces recorded by the semi-automatic defibrillators. Finally, the Monaco Red Cross has already trained 650 people, who are not healthcare professionals, to use them in the context of their work (police, stadium stewards, hotel and shopping centre staff, carabinieri, etc.). This training is long (approximately six days) since it represents the last grade in the first-aid diploma. When these semi-automatic defibrillators were installed, the Monaco Red Cross started a pilot training programme, only two hours long, to teach how to use the semi-automatic defibrillator and life-saving gestures. This training is free of charge and targets the population as a whole. The success of this initiative is based not only on the installation of these devices, but essentially on training as many people as possible to their use. The Association wishes to have these semi-automatic defibrillators installed even in private areas, like large residential buildings in Monaco, since some 70% of heart attacks occur in the home.

A NEW DIMENSION FOR MEDICAL RESEARCH



> Research: the mission of the Centre Scientifique de Monaco

The link between health care and medical research is very strong. There can be no modern innovative care without active participation of physicians in research. Medicine is a science that is changing increasingly rapidly and requires constant innovation. Optimum treatment of patients with the most severe diseases is possible only where research is closely associated with care. The same holds true for the complex new therapies that now emerge daily.

This is why the Monegasque government recently wished to grant the Centre Scientifique de Monaco a new dimension. Founded by Sovereign Decree by Prince Rainier III in 1959, the Centre Scientifique was dedicated at the time exclusively to research in marine biology. By Sovereign Decree of 24 June 2008, Professor Patrick Rampal, former Dean of the Medical School of Nice, was appointed President of the Centre Scientifique de Monaco, with the mission to create medical research activity alongside marine biology research.

This activity will be organized on three levels. First, by creating an assessment body in the form of a seven-member scientific council made up of international academics in medicine. Then, by inciting the Principality's different medical players (at the CHPG, IM2S, CCT of Monaco and private practitioners) to undertake clinical research. This incentive will be implemented by a policy of calls for tender for projects. Finally, consideration is being given to the possibility of creating a translational research activity (basic research that can be applied to patients) in the Principality, as well as a technological valuation platform in partnership with the Chambre de Développement Economique.

> A virtual university: an appealing project

Creating an outstanding virtual university in Monaco: such is the ambitious project proposed in February 2008 by Professor Philippe Évrard, Head of Paediatric Neurology at the Hôpital Robert-Debré in Paris. This project has support from the Princess Grace Foundation and attracted the interest of Prince Albert II and the Princess of Hanover.

The Université médicale virtuelle de Monaco (UMVM) would have a threefold vocation: training physicians, providing health education and training researchers also by circulating the results of their research. At the start, the specialities taught were to be limited to Professor Philippe Évrard neuropaediatrics. Then, it seemed interesting to address other paediatric issues and pathologies: epilepsy, children's metabolic diseases, disabilities, sickle-cell anaemia, interventional radiology, cardiology, neurosurgery, paediatric surgery and basic research on neuroprotection.

One-third of the teachers must be French or Monegasque, one-third from Europe and one-third from the rest of the world.

Several internationally-known personalities have agreed to teach when the programme is set up.

According to Professor Philippe Évrard, it is necessary as from now to develop an efficient international-level *e-learning tool*, which does not exist at present, to *"achieve most of our objectives in teaching, research and cooperation."*

That's the project; now the practical conditions for teaching and funding remain to be defined.

The UMVM, with support from the Princess Grace Foundation, launched a campaign to attract members with different levels of fees, but it should benefit from a great diversity of sources of funding.



A NEW HOSPITAL SOON



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Monaco will have an ultramodern hospital. The first part of the project should, by the end of 2013, lead to delivering 100% of rooms in medicine, surgery and obstetrics, and 100% of the logistics sectors. Prince Albert II personally unveiled the model of the future Centre Hospitalier Princesse Grace in April 2008. The project selected by the Sovereign, after consulting an ad-hoc committee and with help from the Director General of Hôpitaux de Paris, is the work of *OTH Ingénierie Vasconi Associés Patrick Raymond Ingerop Group*.

This hospital aims to be as perfectly integrated as possible into the site of Monaco, as well as satisfying the need for well-being of its 2,000 medical and hospital staff and its patients. In Claude Vasconi's words, *"Patients in hospital must lose all anxiety at going to hospital. It will not create segregation between those with a view on the sea and the others, and seeing the sun is already part of the cure."* One of the essential dimensions emphasized by the architect is for this hospital to be well tempered. To achieve this, for example, the roof will be covered with solar panels produce 40% to 50% of the building's needs in electricity. It will be the first to implement this new energy policy. All the rooms, except in psychiatry, will look towards the sea and have loggias. They will also have ceiling-panel heating to provide air-conditioning and avoid mixing air that can contribute to propagating nosocomial diseases.

The entire lower part of the building, which will house the logistics, will be made of stone with plants to prolong the vegetation against the supporting wall of Boulevard Pasteur. The walls above will be made of glass. On the technical support centre, shafts of light will provide natural daylight activity areas. Natural light will be a key element in this new hospital; on Boulevard Pasteur it may also be covered with glass.

Finally, the project aims beyond HQE standards for the equipment necessary to build the hospital. Claude Vasconi has worked with specialists from Nice and Geneva to improve performance and use materials "we won't regret for 30 years."

What are these long-lasting materials? *"That will be one of the basic questions: that will be part of the work on the project,"* says Claude Vasconi. The only difficulty for a hospital, he recognizes, *"is that hygiene has priority over environmental quality. The materials imposed are too often in ranges that do not correspond to HQE standards. But we'll find products that correspond to these concerns."*

Rethinking the hospital

During His speech on the day He unveiled the model for the future CHPG, HSH Prince Albert II emphasized that, by selecting the Vasconi project, it was a matter of *"rethinking the hospital, having an ambitious project and making a strong architectural statement."* And the Sovereign Prince continued: *"This hospital displays the most harmonious integration into the site. It privileges the quality of hospitalization with its rooms facing the sea. It is the instrument of a cutting-edge health policy for Monegasques and other potential patients. It is a costly operation, but one that expresses the will to give the medical corps and healthcare teams the most sophisticated tool to work with, one they can be proud of."*





STANDARD 24-BED ACCOMMODATION UNIT

Key figures

- 482 beds and capacity
- 386 rooms with a view on the sea
- 80,000 m² surface area, including 28,000 m² parking space
- 1,100 parking spaces
- Cost: 630 million euros
- Start of works: 2010
- Liaison scheduled: 2013 (100% of facilities in medicine, surgery, obstetrics and logistics)
- Opening at the CHPG: 2018



Distribution of rooms

- Hospitalization in surgery > 4 units of 24 beds
- Hospitalization in medicine > 5 units of 24 beds
- Hospitalization in gynaecology > 5 beds, obstetrics: 25 beds, neonatology: 6 beds
- Hospitalization in paediatrics: > 12 + 4 in day hospital
- Hospitalization in physical medicine and rehabilitation > 24
- Intensive care >15
- Day hospital in surgery > 20
- Day hospital in medicine > 30
- Haemodialysis > 24
- Hospitalization in psychiatry > 70 + 10 in day hospital
- Short-term hospitalization unit > 16
- Check-up unit > 15

Total number of beds and capacity > 482



CENTRE HOSPITALIER PRINCESSE GRACE (CHPG)



The Centre Hospitalier Princesse Grace is a hospital that provides care for the local population (emergency care, obstetrics, paediatrics, medicine, pneumology, functional rehabilitation, orthopaedics, traumatology and general surgery, psychiatry, medium and long-term stays...) and activities for referrals (cardiology, digestive surgery, specialized surgery, urology, haematology-oncology, radiotherapy, intensive care, nuclear medicine, therapeutic, biliopancreatic and oesophageal endoscopy, therapeutic colonoscopy, interventional radiology).

It has top-level staff and a technical support centre with the most cutting-edge facilities, which enables it to ensure most activities, except those relating to cardiothoracic surgery and neurosurgery.

The establishment covers the main medical and surgical activities on a surface area of 50,000 square metres in a top-quality environment:

- Anatomopathology
- Anaesthesia-resuscitation
- Cardiology
- Blood transfusion centre
- Ambulatory surgery
- Visceral surgery
- Orthopaedic surgery and traumatology
- Dermatology
- Abdominal and digestive ultrasound
- Endocrinology, diabetology and nutrition
- Interventional endoscopy
- Functional neurology exploration
- Geriatrics
- Gynaecology
- Hepatogastroenterology
- Hospitalization and care in the home
- Hospital hygiene and epidemiology
- MRI
- Medical information
- Biology laboratory
- Maternity, obstetrics
- Medicine
- Internal medicine, haematology-oncology
- Nuclear medicine
- Physical medicine and functional rehabilitation
- Multipurpose medicine
- Nephrology, haemodialysis
- ENT, maxillofacial surgery
- Ophthalmology
- Paediatrics, neonatology
- PET scan
- Pharmacy

CHPG missions

The Centre Hospitalier Princesse Grace successfully satisfies its public service missions, both referrals and local community. It provides patients with personalized treatment and unquestionably excellent care, thanks to top-level physicians and highly professional staff. The establishment's technical support centre, comparable to that of a teaching hospital in France, is testimony to the CHPG's ambition to maintain and constantly improve its centres of excellence.

Driven by this dynamic rationale, the Centre Hospitalier Princesse Grace will be rebuilt starting in 2011: an architectural 'flagship', the future hospital will be digital, communicating and committed to sustainable development. A fabulous instrument for its staff, it will offer total comfort for patients. At the same date, a complete facility for treating the elderly, unique in the region, the Clinical Gerontology Centre, will open its doors.

The Centre Hospitalier Princesse Grace aims to promote networking and synergy in the service of patients. Thus, the establishment enthusiastically espoused the Principality's will to promote medical research through the Centre Scientifique de Monaco. It is with the same drive and conviction that the Centre Hospitalier Princesse Grace has and will continue participating, through its practitioners, in the organization of medical conventions in the Principality, for the purpose of making known the latest advances in medical science.

Patrick Bini > director





PR ALAIN TREISSER

DR BERNARD BENOÎT

- Pneumology
- Medical psychiatry and psychology
- Radiology
- Interventional radiology
- Radiotherapy
- Rheumatology
- Scanography
- Mobile unit for palliative and supportive care (UMSPS)
- Emergency care
- Urology lithotripsy
- Infectiology consultation for travellers
- Screening centre

The CHPG has a cutting-edge technical support centre that is constantly upgraded, comprising:

- four operating theatres and three intervention rooms;
- cutting-edge Medical Imaging Departments (*voir below*)
- a technical support centre for cardiology with a catheterization room and electromagnetic catheter navigation apparatus;
- a Radiotherapy Department with a linear accelerator;
- a cutting-edge lithotripter;
- an endoscopic setup (endoscope ultrasound and endoscope) and a video-capsule system;
- a system for computer-assisted surgery;
- a biological analysis laboratory;
- a blood transfusion centre;
- a Pathology Department;
- a PACS image processing and analysis system in the process of being rolled out.

> Maternity

There are nearly 1,000 births every year in Monaco. The Obstetrics and Gynaecology Department at the CHPG also treats female pathologies.

Run by Professor Alain Treisser since the end of 2001, the maternity ward in Monaco is particularly appreciated, since many mothers – celebrities and others – wish to give birth here. Professor Treisser invited Dr Bernard Benoît and Dr Jacques Raiga to join him as Deputy Department Heads. Dr Bernard Benoît is *“a world-famous sonographer, one of the first to have developed 3D ultrasound,”* emphasizes Professor Alain Treisser. Dr Jacques Raiga is a specialist in gynaecological surgery and coelioscopic procedures, which enables him to perform many surgical operations: hysterectomies, ablation of ovarian cysts and fibromas, treatment of extra-uterine pregnancies, as well as surgery in case of infertility. He also treats pelvic statics disorders (prolapse and urinary incontinence), usually by vaginal route and performs surgery for gynaecological cancer. Jacques Raiga is also pleased to be able to perform these operations thanks to a very sophisticated pluridisciplinary technical centre, with visceral surgeons and urologists with whom exchanges and cooperation are often very useful. Gynaecological surgery represents approximate a quarter of the Department's activity.

Anaesthesia resuscitation: some figures

- 10,000 anaesthesias a year, local and general
- 15 anaesthetists
- 30 nurse-anaesthetists
- 35 patients a day are anaesthetized and treated
- 4 operating theatres, including maternity
- 12 operating rooms
- 4 recovery rooms
- 3 endoscopy rooms



DR JACQUES JOBARD



DR PATRICK NICCOLAI

Staff (in full-time equivalent)

> 160 physicians and 1,600 agents

and some figures (2007)

- Births > 921
- Surgical activity > 7,376 operations
- Biological analysis laboratory activity > 23,366,288 tests
- MRI activity > 4 712 examinations
- CT-scanning > 11 481 examinations
- Number of PET examinations > 1,634

CENTRE HOSPITALIER PRINCESSE GRACE (CHPG)



PR NADIR SAOUDI



> Cardiology

The Centre Hospitalier Princesse Grace (CHPG) has a cutting-edge Cardiology Department specialized in the study of cardiac rhythm. The Department Head, Professor Nadir Saoudi, is a member of many Cardiology societies; he chaired the cardiac rhythm study group for the Société Française de Cardiologie and has already been engaged in research. He is assisted by three Deputy Department Heads: Dr Jean-Paul Rinaldi, Dr Philippe Ricard and Dr Kelil Yaici.

The Department has state-of-the-art facilities, with a 60-square-metre catheterization room in the centre of the intensive care unit equipped with a latest-generation flat-screen image intensifier and coupled with a catheter guiding system by giant magnets. This system manipulates an intracardial catheter which, after standard insertion, is guided inside the heart cavities without touching the patient. The combined action of two giant magnets, each weighing two metric tons, creates an intense magnetic field in the middle of the thorax, to align the catheter head, which is pushed or pulled by a computer-assisted advance and retract system to reach any area in the heart cavities. This revolutionary technique is coupled with a software series controlling such gestures as automated radiofrequency ablation of endocardial arrhythmia. The CHPG was among the first establishments in Europe to acquire such equipment.

Moreover, the functional cardiovascular exploration laboratory offers all the modern methods for cardiovascular analysis. In terms of imaging, the ultrasound laboratory is perfectly equipped, including real-time 3D analysis technology, placing it on the cutting edge of modern imaging of the heart and blood vessels. In this respect, the CHPG is the first centre in the Principality and in France to have been equipped with the latest-generation 3D transoesophageal probes, associated with a post-treatment workstation. The new 3D matrix probes with 2,700 miniaturized piezoelectric elements using *PureWave crystal* technology are 85% more effective than standard ceramics for finer analysis of anatomical structures.

Analysis at rest may be completed by stress tests on an ergometric table or thanks to pharmacological means used routinely at present. With soon five ultrasonographs (including some intended for use in the catheterization room or at patients' bedside), patients will benefit from care that is better adapted to their case. In testing for loss of consciousness, *tilt tests* help orient diagnosis favourably by seeking a vagal potential.

It is also useful to emphasize the importance of direct and indirect functional evaluation effort capacity tests in heart patients and in athletes, whether amateur or professional, with measurement of direct or indirect Vo2 max with a cycloergometer or a treadmill. In short, the CHPG explores virtually all cardiovascular pathologies daily by non-invasive route for patients' comfort and safety.

The CHPG Cardiology Department is also one of the centres that will test the Tacticath, a new-generation Swiss-design catheter, for radiofrequency ablation of tachycardia. This technique, implemented since 1991, can destroy the mini-zone at the origin of tachycardia by radiofrequency, by inserting a catheter into one of the four heart cavities and by heating the concerned area at 60 or 70°C. It has been discovered that this method is particularly effective if there is good contact between the catheter and the beating heart. Hence the need for very sophisticated technology assessing this parameter. If it fulfils all its promises, Tacticath may represent considerable progress. The CHPG Cardiology Department was also one of the first to use the CartoMerge image-fusion technique, for fusing images from the scanner before surgery and 3D views acquired peroperatively in virtual reality. One of this method's advantages is to reduce operating time and navigate without X-rays, or with an exposure time that is as short as possible.

Finally, the Department's activity is characterized by a dedication to research punctuated by regular publications (48 scientific articles since 2001) in French, Chinese and English-language journal. The Department's presence in major meetings in Europe, the Americas and Asia has been constant since 2001 (30 oral papers).



Since it was not possible to give a complete presentation of all the departments in the CHPG in this document, we provide below a list of the other Department Heads' names:

- Jacques Jobard > Anaesthesia, resuscitation
- Cristel Fissore-Magdelein > Polyvalent Biology Laboratory
- Jean-Michel Cucchi > MRI (magnetic resonance imaging)
- Michel Fabre-Bulard > Medicine
- Valérie Bernard > Physical medicine
- Christophe Robino > Nephrology
- Frédéric Bétis > Ophthalmology
- Jacques Rit > Orthopaedics
- Jean-Claude Picaud > Paediatrics
- Sylvaine Maricic > Pharmacy
- Michel Sioniac > Pneumology
- Valérie Aubin > Psychiatry
- Olivia Keita-Perse > Epidemiology and hospital hygiene
- Bernard Ghiglione > UMSPS and home hospital care
- Philippe Mélandri > Emergency care
- Christian Choquenot > Urology and lithotripsy

> Gastroenterology

The field of action of hepatogastroenterology is extremely vast; it concerns all diseases of the liver and the digestive tract, representing some 800 different affections. According to recent hospital statistical data, digestive pathology, without even including digestive cancer, is the prime reason for hospitalization in public and private institutions (12% of all hospital stays). Furthermore, we know that digestive and liver cancer represent 25% of malignant tumours and are largely diagnosed and treated in gastroenterology departments.

Aware of the importance of diseases of the digestive tract in terms of public health, the Monegasque authorities have expressed a strategic will to structure a centre of excellence for digestive diseases at the Centre Hospitalier Princesse Grace. This is why the CHPG has several exceptional assets: a medical team of skilled gastroenterologists with a wide range of complementary competencies, a dynamic team of equally competent digestive surgeons, a technical support centre of the finest quality in diagnostic and interventional digestive endoscopy, highly motivated paramedical staff that is always very receptive, an excellent partnership between the different departments focusing on patients.

A strong focus emphasized by medical gastroenterology concerns therapeutic endoscopy which has developed considerably in recent years. From endoscopy for the sole purpose of diagnosis, it has moved successively from the possibility of performing exeresis of polyps and endoscopic mucosal resection. The latest advance to date in interventional endoscopy is transluminal endoscopic surgery (NOTES), with no scar, which will surely emerge as a technique that is competitive in many ways with conventional surgery. Transluminal endoscopic surgery by natural route was described in 2004. In 2007, the scepticism that surrounded this technique at the time of its initial description was replaced by great enthusiasm.

Interventional endoscopy

Technical progress has enabled Dr Rémy Dumas to develop therapeutic endoscopy at the CHPG. In fact, therapeutic digestive endoscopy groups a wide variety of treatments using a flexible endoscope inserted in the digestive tract by natural route: usually the mouth, sometimes the anus. The general public is most familiar with oesogastroduodenal endoscopy (gastroscopy) and, of course, colonoscopy for the detection and exeresis of polyps to prevent them from developing into colon cancer. Improved endoscopes, especially with the rising use of video and the development of self-expandable stents, led to perfecting many forms of therapeutic digestive endoscopy.

According to specialists, therapeutic endoscopy actually serves as a complement to traditional surgery or coeliosurgery.

CENTRE HOSPITALIER PRINCESSE GRACE (CHPG)



DR RÉMY DUMAS

In advanced stages of digestive cancer or in elderly subjects, therapeutic digestive endoscopy has a palliative role. It is very often used to make life more comfortable for inoperable or elderly patients by avoiding surgery, re-permeabilizing the oesophagus, bile ducts or intestine in case of occlusion, by placing a self-expandable stent that can avoid having a temporary or permanent artificial anus.

The other role of this type of endoscopy is to facilitate surgery. For example, cholecystectomy (ablation of the gall bladder) is easier to perform by coelioscopy after removing gallstones in the common bile duct using interventional digestive endoscopy.

Thus, therapeutic endoscopy is often practised in biliary and pancreatic diseases. A flexible endoscope is then inserted by the mouth to the duodenum at the junction of the pancreatic canal and the bile duct (which drains bile from the liver where it is formed to flow into the digestive tract), in order to disobstruct these ducts by sliding in a self-expandable stent or a drain. This is the case when, they are obstructed by a tumour or strictured. Thus, the gallstones formed in the bladder can be removed when they block the bile duct, which may cause septicaemia from the biliary tract.

Therapeutic digestive endoscopy has other fields of application, mainly treatment of digestive bleeding (ulcers, oesophageal varices, rectal angiomas after radiotherapy) using clips, ligatures or argon-plasma electrocoagulation...; as well as treatment of superficial cancer of the colon, stomach or oesophagus, or mucoid plaque that may lead to canceration by musosectomy, i.e., by 'peeling' of the digestive mucosa or other processes. The endoscopy sector also performs needle biopsy by endoscopic ultrasonography, indispensable in the context of treatment of digestive oncology, which has a strong presence at the CHPG.

It has an enteroscope for biopsies and treatment in the small intestine after video-capsule diagnosis, in which a miniaturized camera is swallowed by the patient and emits signals to sensors in the abdomen, thereby providing a complete video.

Monaco-Boston live broadcast

On Saturday 6 October 2007, operations at the CHPG Endoscopy Department were broadcast live to Boston and several Latin American countries by satellite. This event took place in the context of the 'Boston International Live Endoscopy Course', involving nearly 500 American interventional endoscopists. This event was devised by Ram Chuttani, a specialist at the Beth Israel Deaconess Medical Center, and Professor Patrick Rampal, Head of the CHPG Hepatogastroenterology Department, using the CHPG's exceptional technical expertise in endoscopy. Other hospitals were associated in this programme: the Rhode Island Hospital, Boston Medical Center, Brigham and Women's Hospital and Massachusetts General Hospital.

The procedures were performed by Dr Rémy Dumas, Head of the endoscopy sector, his co-worker Dr Jean-François Demarquay and Dr Marc Giovannini, of Institut Paoli-Calmettes in Marseille. The cost of such a satellite broadcast is approximately 50,000, this solution having been preferred to the Internet to have a better quality image. This was an interactive transmission, since American convention goers could ask questions to the two endoscopists during their procedures.



DR CHARLES FERRARI

> Visceral surgery

Since June 2005, Dr Charles Ferrari has headed the General Visceral Surgery Department at the Centre Hospitalier Princesse Grace. The Department's activity practically doubled in the very first year, and is still growing rapidly (+17% between 2006 and 2007). This growth can easily be explained by the staff's competence, the quality of care and management, as well as the internal organization and cooperation with the other CHPG departments.

The medical competencies also open a broad field of activity to help patients, with seven qualified surgeons for forty-two hospital beds and eight beds for post-op care and resuscitation. General visceral surgery is the qualification shared by all the practitioners (*see box*). But Dr Charles Ferrari is also competent in thoracic and oncological surgery.

Dr Marie-Christine Missana practises exclusively in oncology and plastic surgery of the breasts. Dr Fabio Nardi orients his activity towards bariatric surgery (*gastric bypass to control obesity*). And the department includes two plastic surgeons: Dr Didier Commare and Dr Enrica Romeo-Segond. These very broad surgical competencies offer an exceptional range of care for patients, all the more so since the practitioners are perfectly flexible. Finally, the quality and management of care in the Department are recognized, as attested by satisfaction surveys of patients. The healthcare staff's dedication and competence should also be emphasized.

The Department's internal organization is very strict and seeks to improve the quality and safety of care. Thus, every surgery patient is seen twice a day by the surgeon making the referral. The surgical team's senior surgeon on call provides twenty-four-hour-a-day emergency care; he is backed by another surgeon on call. Transmissions between the Department's surgeons take place between 7am and 8:30am, before the operating theatre activity, during the '*grande visite*'. Finally, each patient seen in consultation

for non-urgent scheduled surgery is recorded on a transmission form immediately sent to the appropriate hospitalization sector, the operating theatre and the consultation with the anaesthetist.

Cooperation with the other CHPG departments takes place with gastroenterology, internal medicine, medical oncology, pneumology, physical medicine, radiology, radiotherapy, nuclear medicine, Pharmacy, follow-up and palliative care and, of course, resuscitation anaesthesia. These departments' competence and quality give surgery all its amplitude, in all security, each one remaining obviously within the strict limits of its competence.

The most obvious aspect of such cooperation takes two forms: on the one hand, through weekly medico-surgical gastroenterology meetings; on the other hand, in oncology, with pluridisciplinary consultations (*RCP - réunions de concertation pluridisciplinaires*), in which each patient's file is discussed by a group of physicians including at least one oncology surgeon, one oncologist, one radiotherapist and one anatomopathologist. A customized care programme is proposed following these meetings (*see below*).

The exceptional growth of surgical activity results from the medical team and staff's efforts, supported by the hospital's management.

Seven qualified surgeons:

- Dr Charles Ferrari > Department Head
- Dr Marie-Christine Missana > Deputy Department Head
- Dr Hubert Perrin > Deputy Department Head
- Dr Nicoletta Ambrosiani > Hospital Practitioner
- Dr Adolfo Gavelli > Hospital Practitioner
- Dr Anna Marmorale > Hospital Practitioner
- Dr Fabio Nardi > Hospital Practitioner
- Dr Didier Commare > Plastic Surgeon
- Dr Enrica Romeo-Segond > Plastic Surgeon

CENTRE HOSPITALIER PRINCESSE GRACE (CHPG)

> Oncology

The CHPG has a Department of Internal Medicine / Haematology / Oncology equivalent to that of a teaching hospital. It is organized in two sections: the day hospital in oncology and consultations directed by Dr Georges Garnier and complete conventional hospitalization directed by Dr Bruno Taillan. The former performs diagnosis and outpatient therapy, while the latter is for more serious pathologies requiring palliative or supportive care, in particular.

The CHPG can treat all haemato-oncological pathologies, except for performing bone marrow transplants, not frequent enough to justify such an activity and referred to Nice (L'Archet or Lacassagne).

The CHPG's major asset is the exceptional quality of the technical support centre, in particular in imaging and in interventional radiology. For example, where there may be several days of waiting, in Monaco, it is possible to have an MRI in the afternoon or a PET scan within a week. *This is positive both for treatment and for the duration of the patient's stay*, emphasizes Dr Bruno Taillan. Other advantages of the CHPG: its single-block structure providing for an interface facilitated between the different departments and a pluridisciplinary approach to treating patients.

For the many patients treated every year at the CHPG in haematology-oncology, *"we apply 'Best Practice' techniques,"* explains Dr Bruno Taillan. In other words, each patient benefits from the best, most cutting-edge treatment. Although the attending physician provides contact with patients, therapy is defined in the context of weekly meetings, RCPs (pluridisciplinary consultations), held every Monday, with representatives of the specialities concerned. This is teamwork and the teams must work together. *"In Monaco, this works well,"* declares Dr Bruno Taillan.



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Physicians or departments participating in RCPs

- 3C coordinating physician
- Surgeon qualified in oncology
- Specialists of organs
- Medical oncologist
- Oncological radiotherapist
- Anatomopathology
- Palliative care
- Medical Imaging and Nuclear Medicine
- Pharmacy
- Paramedical disciplines
- Management
- Department of Medical Information

'3C'

At the end of 2007, the CHPG acquired an Oncology Coordination Centre ('3C' in French).

The '3C' *"will formalize and coordinate all activities linked to treating cancer patients,"* Professor Pierre Dujardin, the 3C's coordinating physician, specified when it opened. The Centre works closely with the outside, especially in France, since it belongs to the regional oncology network, Oncazur. Thus, the 3C harmonizes, for the purpose of improving, treatment of cancerous pathologies.

RCPs

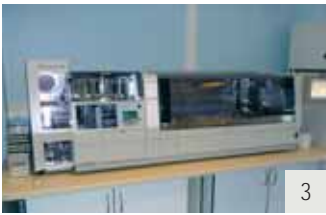
RCPs (pluridisciplinary consultation meetings) are held every week. They usually include a surgeon, a medical oncologist, a radiotherapist, an anatomopathologist, a specialist of organs and a medical imaging representative.

> Pathology

The Centre Hospitalier Princesse Grace (CHPG) offers, as for other specialities, a state-of-the-art Pathology Department, ranked seventh in terms of overall activity among the seventy general hospitals in France, and is on a par with certain departments in teaching hospitals, as Dr Claire Mainguené, explains.

The Pathology Department at the CHPG received several types of samples:

- cytological, like Pap smears for screening, pleural, peritoneal and cerebrospinal fluid, urine samples, etc;
- biopsies and the products of tissue resection, often obtained endoscopically;
- surgical samples taken during operations (gall bladder, intestine, stomach, lung, kidney, prostate, breasts and other human organs).



DR PIERRE LAVAGNA

Overall, the Pathology Department processes nearly 15,000 cases a year, corresponding to samples from all CHPG departments, the hospital of Menton and private practitioners in the Principality. The Pathology Department receives a wide range of samples from all medical and surgical specialities: pneumology, hepatogastroenterology, urology, visceral surgery, orthopaedic surgery, gynaecology obstetrics, stomatology and ENT, dermatology and interventional radiology, etc.

Cancer has an increasingly important place in this activity. As Dr Claire Mainguené recalls: *"at the last Biennale de Cancérologie in Monaco, it was emphasized that, for the same age group, the incidence of cancer has increased by 30% in twenty years."* Nonetheless the Department's activity extends to many pathologies other than cancer, from tuberculosis to scabies, including leishmaniasis, transmitted in the PACA Region (southeastern France) by sand flies (phlebotomus), to mention only a few.

1. Hood for macroscopy, for aspirating formaldehyde fumes, indispensable for tissue preservation, fixing solution whose toxic vapours are carcinogenic for technicians and pathologists.
2. Tissue-Tek Xpress 120 performs rapid, formalin and xylene-free processing of tissue and adds a crucial advantage to the field of molecular pathology by preserving DNA, RNA and proteins.
3. Staining machine for standard staining of tissue sections on slides and certain 'special' stains, then the preparation or 'mounting' of slides, automatically covered with transparent film and adapted for microscopic examination. This machine can stain 720 slides simultaneously and 'mount' 1,080 slides in one hour.
4. Specific hood for handling toxic chemicals and preparing the reagents used for histochemical staining: aspiration of fumes from hazardous chemicals necessary for cell and tissue staining. Hoods equipped with specific filters for environmental protection.
5. Latest-generation immunohistochemistry machines for performing all the technical steps in immunohistochemistry, from dewaxing of tissue sections, including specific cell antigen-antibody reactions, to revelation of stained cell marking, quantified under a microscope.
6. Microbiological safety station: laminar air-flow hood used for handling fresh samples, like cytology of potentially infectious biological fluid of bronchial, pleural, peritoneal or other origin and contaminants for professionals.

> Otorhinolaryngology and Maxillofacial Surgery

Directed by Dr Pierre Lavagna since 1992, the CHPG Department of Otorhinolaryngology became the Department of Otorhinolaryngology and Maxillofacial Surgery in 1997, with the arrival of Dr Albert van Hove, stomatologist and maxillofacial surgeon.

Located on the first floor of Centre Hospitalier Princesse Grace, the Department comprises a consultation unit and an operating theatre. Hospitalization is in the Departments of Surgical Specialities or Ambulatory Surgery.

The consultation unit features equipment worthy of the finest teaching hospitals, in particular in the area of functional exploration of hearing and equilibrium disorders, where the Department is proud of its reputation on the regional level. In 2007, a computerized stabilometric platform was added to the technical support centre, which was already quite complete.

Specialized consultations in otorhinolaryngology, stomatology and maxillofacial surgery are available for hospitalized patients as well as patients from the outside. In recent years, consultations in high-level dental implantology complete the range of care with cutting-edge implantology simulation software. More recently, phoniatics consultations are possible in cooperation with the Medical Centre of Cannes. The Department's operating theatre adjoining the consultation unit also features the latest surgical facilities for top-level expertise in each of the areas of surgery practised:

- infantile surgery: to our knowledge, the Department is the only one in the Region to perform adenoidectomy using a microdebrider with an optical guide for a safer, more complete procedure;
- endoscopic sinus surgery: in addition to videosurgery equipment and a microdebrider for removing polyps, the Department acquired computer-assisted surgical facilities two years ago;

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DR PHILIPPE BRUNNER

- cervicofacial surgery: a cutting-edge peroperative monitoring system helps reduce the risk of lesions during thyroid surgery and surgery of the salivary glands.

Finally, without being exhaustive, surgeons also have an operating microscope, therapeutic laser and a latest-generation radiofrequency generator.

In addition to its own activities, the ENT Department also participates in many others within the establishment: treating disorders of balance in elderly patients in cooperation with the Geriatrics and Functional Rehabilitation Departments; screening for hearing disorders in newborns*; oncology, by participating in multidisciplinary meetings within the CHPG and the CAC (Cancer Research Centre) in Nice, as well as performing most ENT oncology surgery in the Department.

Finally, the Department's physicians teach at the CHPG IFSI (*Institut de Formation en Soins Infirmiers*) and regularly organize post-graduate classes within the establishment.

* At the instigation of the ENT Department, the CHPG was one of the first hospitals in Europe to set up systematic screening for hearing disorders in all newborns over ten years ago.

> Interventional radiology

The Medical Imaging Department is one of the CHPG's showcases. Its technical support centre is exceptional and has always benefited from the latest technological innovations. It now comprises three Departments: Nuclear Medicine (Prof Pierre Rigo), MRI (Dr Jean-Michel Cucchi), Interventional Radiology scanner and Conventional Radiology (Dr Philippe Brunner).

Interventional radiology has a very special place because of its exponential development and its reputation in France and worldwide. This recent speciality in imaging represents a natural extension of this discipline. Since diagnostic imaging and especially slice imaging (scanner, MRI) are becoming increasingly fast and accurate, it is now possible to use these techniques for 'intervention' purposes. These technologies' improved spatial resolution and contrast resolution provide for very rapid millimetric positioning to the confines of the human body of needles, electrodes, probes, inflatable cuffs, optics fibres, to deal locally, in 'minimally-invasive', but safe and effective conditions, with pathologies that could, so far, be treated only by standard surgical techniques. The field of application of this new speciality has grown and continues to expand very rapidly, and its limits are not yet (and will probably never be) known.

Originally, the applications of interventional radiology were essentially vascular; radiologically guided navigation through the arteries (fantastic voyage!) provides for effective treatment of arterial stenosis. With the same philosophy, it then became possible to embolize bleeding arteries, responsible for haemorrhage. In this area, the CHPG has acquired considerable experience, especially in embolization of post-partum bleeding, haemorrhage of traumatic origin and treatment by embolizing uterine fibromas.

Oncology is another area of excellence for the CHPG interventional radiology unit. It has produced many scientific studies on the subject. Dr Philippe Brunner has received several awards from learned



societies and in international meetings for his work in this field; he is also part of the Institut National du Cancer (INCA) experts group. The main tools for cancer treatment using interventional radiology are chemoembolization and tumour ablation (laser, radiofrequency).

Chemoembolization involves in situ injecting of anti-tumoral drugs directly into tumours by arterial route.

Tumour ablation techniques by laser are used for small tumours.

Radiofrequency has considerably altered treatment of tumours in the liver, kidneys, lung, bone... An electrode is inserted, guided

essentially by scanner, into the lesion to be treated and the radiofrequency generator connected to the electrode creates ionic agitation that denatures intracellular proteins, thereby killing tumoral cells. Imaging ensures optimum positioning of electrodes, as well as controlling the real time of treatment: only what needs to be treated is treated, with no collateral damage.

Most of the time, these procedures are performed under sedation or simple local anaesthesia; the point of entry on the skin is on the order of one millimetre, which makes the surgical sequelae simpler and shorter than after 'standard' surgery. This entails effective

> Units

Diagnostic scanner unit

Diagnostic scanner activity is constantly growing, with slice imaging gradually replacing conventional radiology in part. Several recent orientations are being developed in this unit. They are in phase with three strong areas: cardiology, oncology and pain, in close cooperation with the clinical departments concerned.

Cardiac imaging (including the coronary scanner) is playing a growing role in the detection of coronary lesions in asymptomatic subjects. Patients in the Cardiology Department also benefit from this form of imaging to explore the coronaries, heart cavities, ventricular function, before treatment by radiofrequency of cardiac rhythm disorders. This technique is now validated and is replacing the more standard

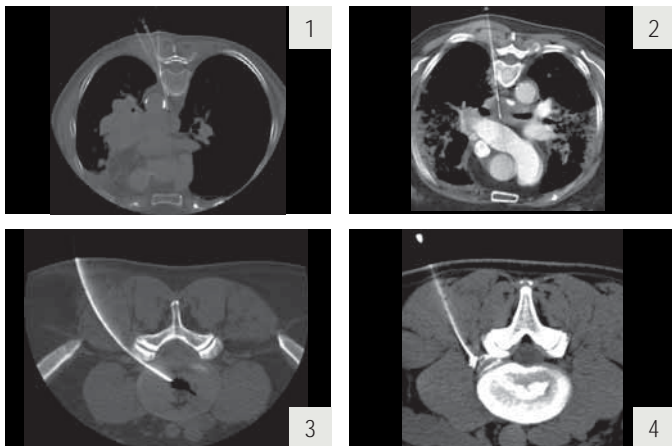
invasive techniques (coronarography). These examinations are performed in cooperation with the CHPG cardiology team to pool competencies in radiology and cardiology. At present, two weekly shifts are dedicated to cardiac imaging.

Imaging of colon (virtual colonoscopy) is another innovative technique that has proved its efficacy in the detection of pathologies (polyps, tumours). Unlike traditional colonoscopy, this technique requires no anaesthesia; this simplifies preparation of patients for the examination. This innovative technique is performed in cooperation with the CHPG gastroenterology team. One weekly shift dedicated to imaging of the colon is a realistic objective in the short term.

Full-body scanning is more and more in demand. Screening for tumours is

a widespread practice in the United States. It is not covered by the French or Monegasque healthcare system without clear medical reasons; this means it is practised essentially outside with patients not in the national healthcare system. A weekly shift has been instituted. Performing a full-body scan in multiple-trauma patients is medically justified, by avoiding the repetition of conventional radiographic check-ups and accelerating treatment of these patients. Installing a scanner in the Emergency Care Department is yet another option in the longer term. Another project would entail performing such complete examinations virtually systematically in patients 'entering' pilot medical departments.

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techniques, validated for specific indications that are becoming increasingly important in cancer treatment.

The third area of excellence of the CHPG Interventional Radiology Unit is the treatment of pain. Dr Philippe Brunner was a pioneer in treatment targeting pain. Different types of pain can be treated, including 'degenerative' pain due essentially to osteoarthritis, pain linked to spinal pathologies (slipped discs, narrow vertebral canals, vertebral compression) and pain linked to cancer.

'Degenerative' pain can benefit from targeted treatment using medical imaging, which involved essentially injection in joints affected

by osteoarthritis of cortisone derivatives with slow resorption, or recognized restructuring products, like hyaluronic acid. Only guiding by imaging, with prior injection of contrast agents, can ensure intra-articular injection of these products to obtain optimum efficacy.

Some herniated discs can benefit from the efficacy of percutaneous treatment: these techniques are based on laser or radiofrequency disc decompression. These disc decompression treatments have been practised since 1992 at the CHPG, without hospitalization, under simple local anaesthesia. The laser fibre or radiofrequency electrode inserted percutaneously in the disc vaporizes the herniated disc.

Dental imaging unit

The dental scanner provides referral imaging, with 'conventional' dental radiology (panoramic dental x-ray) becoming a complement to the dental scanner.

Interventional scanner unit

The interventional scanner unit was launched in May 2006. It functions three days a week (three times six hours). Emergency care is provided in real time outside these shifts. Some 1,400 examinations were performed in 2008. This scanner is also used for diagnostic examinations in case of breakdown, maintenance or saturation of the diagnostic scanner. The reverse is also true. This unit's activity is progressing considerably for two main reasons: the reputation of our

Department's interventional activity, well beyond the PACA Region, ensuring proper recruitment; and the development of the CHPG clinical departments' activity.

This unit's strongest areas are the treatment of tumours and pain. Treatment of tumours has changed considerably in recent years; new minimally-invasive techniques for destroying tumours have emerged, especially radiofrequency. The CHPG was the French Riviera's first establishment to benefit from this new technology (1999), thanks to support from GEMLUC (*Groupe des entreprises monégasques de lutte contre le cancer*). Since then, many patients with liver, kidney, lung or bone tumours have benefited from this treatment. The team was the first to use this technique in treating breast tumours. Their experience in the ablation of tumours has enabled

them to realize many scientific studies in France and worldwide (some of which have received awards from scientific societies) in the area of interventional oncological radiology. Since 2006, Dr Philippe Brunner has been a member of the experts group in oncological imaging at INCA (*Institut National du Cancer*). Other techniques for destroying tumours are also practised in the Department (tumoral chemoembolization, laser photocoagulation...). Histological diagnosis of tumours is also practised daily in the Department, given the importance of haemato-oncological activity at the CHPG. New techniques for biopsies of deep organs guided by scanner are well mastered and will be developed in view of the quality of the results obtained. The treatment of pain is a major asset for the CHPG.

Spinal infiltration techniques are also used daily in the establishment. These infiltrations guided by imaging, essentially scanner, provide effective relief for sciatica, cruralgia, intercostal neuralgia, cervico-brachial, cervico-cranial and facial neuralgia. These techniques give rapid relief for very specific indications when performed by well-trained staff.

Vertebral compression benefits from what is one of the most spectacular technique: vertebroplasty. This technique entails injection, using a three-millimetre-diameter needle of acrylic cement that reshapes solid vertebrae over the long term. The operation, performed under simple local anaesthesia, lasts less than thirty minutes and the patient can walk without pain after one hour. The bone is consolidated in a few minutes (the time needed for polymerization of the cement), while with conventional treatment recovery takes three months (with confinement in bed and the need to wear a corset). The CHPG performs vertebroplasty nearly two hundred times a year.

Pain linked to the evolution of cancer is treated very regularly at the CHPG, given the importance of the establishment's oncology activity. In addition to vertebroplasty for patients suffering from metastases, it is possible to treat some pain due to cancer by neurolysis. These techniques destroy the nerves responsible for conducting the tumour's nociceptive (pain) influx to the central nervous system.

Many other interventional radiology techniques are practised in this unit, in the area of hepatogastroenterology, pneumology, urology...

always in close cooperation with the specialists in these different departments.

To perform all these procedures (over two thousand a year, which places the CHPG in the top three, in terms of activity, French establishments with Institut Gustave Roussy in Villejuif and the university hospital in Strasbourg), the interventional radiology unit has a scanner exclusively dedicated to this activity, an angiography room and a digitized radiology room. This technical support centre helps respond in real time to all requests. It is an exceptionally advanced tool of benefit to all CHPG patients.

1. Complex biopsy of a mediastinal tumour by triple approach
2. Biopsy of a deep ganglion under the trachea
3. Treatment of a slipped disc by laser nucleolysis
4. Micro-infiltration of a slipped disc

Interventional radiology helps optimize treatment for pain. This possibility is an essential advantage compared to 'anti-pain' structures that do not have it. Pain due to cancer benefits from the use of such techniques in certain situations (neurolysis for digestive cancer, radiofrequency, alcoholization and cementoplasty for bone metastases...). Osteoarthritic, spinal and inflammatory pain can be treated in the best conditions by interventional radiology. Herniated discs, compression of the vertebrae, arthropathies and neuralgias are treated at the CHPG using cutting-edge interventional radiology techniques (see above). Spinal pathology will be increasingly treated by percutaneous route in the years to come, thanks to the introduction of new technological concepts with the CHPG will be associated. Of these orientations

for development already initiated and that will surely grow, traumatology is unquestionably an activity with strong potential (scanner-guided, high-precision osteosynthesis of complex fractures).

This interventional imaging speciality has undergone spectacular progression, requiring highly competent operators with perfect mastery of these techniques. These very specific competencies will be achieved by promoting exchange with the teaching hospital of Nice (where Dr Philippe Brunner was trained), as well as other academic structures some of which already have ties with the Department (university hospital in Strasbourg, IGR Villejuif).

Interventional radiology consultation unit

There were two thousand consultations in interventional radiology in 2007. This unit is essential for all patients likely to benefit from interventional radiology, both outpatients and inpatients. The interventional radiology consultation is a key step: it serves to define the indication for a procedure or even reject it, explain to the patient why and how the operation will be performed, describe clearly any possible complications and obtain consent. This consultation is necessarily long and occupies a large part of medical time. It must be clearly individualized, with a dedicated secretariat, secretaries trained in managing cancer patients and algetic patients. The number of external consultations may considerably increase

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with development of the activity of the second interventional radiologist currently being trained.

Vascular radiology unit

The vascular radiology unit is still operational, since emergency care is also provided in real time. Diagnostic vascular and therapeutic examinations, as well as nonvascular or canal interventional procedures are performed in this structure. Vascular radiology is increasingly replaced, as in all hospitals, by other forms of non-invasive imaging (Doppler, angioscanner, angio-MRI). Vascular activity is increasingly oriented towards therapeutic uses. This unit performs haemostatic embolization (haemorrhage on delivery, digestive bleeding, haemoptysis, haemorrhage of tumoral origin...), treatment of uterine fibromas, chemoembolization of the liver, varicocele treatment, chamber implants, essentially venous angioplasty with insertion of stents. Cases of arterial angioplasty are usually referred to the Centre Cardio-Thoracique, by virtue of the conventions between the two establishments. One non-vascular activity is also performed for biliary, digestive, colon and bronchial pathologies, with implants of prostheses in connection with the establishment's specialists. Futures techniques could be developed in this unit in coordination with the team from the Centre Cardio-Thoracique; carotid angioplasty and endovascular treatment of varices (of the lower limbs, female pelvis) are among the areas for which discussion have already begun with this establishment and others.

The skills required to perform these procedures are very specific and increasingly rare; in the long term, a second full-time radiologist will be needed. Outside competencies will make it possible to expand the range of these therapies. Highly specialized medical calls (senior interventional radiologists) cover emergency care, which is often vital, in the latter two units.

Ultrasound unit

Two machines ensure proper functioning of this unit for inpatient and outpatient consultations, including such specificities as paediatric ultrasound and Doppler ultrasound.

Unit for conventional radiology using flat-panel sensors

This unit ensures the hospital's proper functioning on a day-to-day basis of all its components, which includes active participation in operating theatres.

Digital mammography unit

This unit is in the process of development and refocusing of its organization.

> Nuclear medicine

The Nuclear Medicine Department is directed by Professor Pierre Rigo with Dr Mylène Vergé, Deputy as Department Head and Dr Michaël Bondouy. A medical physicist, Benjamin Serrano, is a member of the team. The following describes the facilities and how they work.

Equipment

A double-head gamma camera and two hybrid machines: a PET/CT and a SPECT/CT. The PET/CT camera can perform positron emission tomography (PET) coupled with a CT scanning, while the SPECT/CT is a double-head gamma camera coupled with a CT scanner, SPECT means single photon emission computed tomography and CT computed tomography.

Replacement of the PET/CT by a new-generation machine is scheduled (June 2009). This machine will include 'time-of-flight' technology.

Gamma cameras



DOUBLE HEAD



HYBRID SPECT/CT

Operating principle

In general the radioisotope injected is selected to attach onto a specific region because of its metabolic properties. This uptake allows exploration. The principle of detection is based on the transformation of gamma rays emitted by the patient in light (photons in a visible spectrum) toward the sodium iodide (NaI) crystal. These photons are then transformed via the photocathode into electrons, then amplified by the dynode photomultipliers. At the end, there is an electric signal proportional to the initial gamma rays.

The images obtained may be dynamic, planar or tomographic, since tomography is based on reconstruction of a 3D volume from its projections.

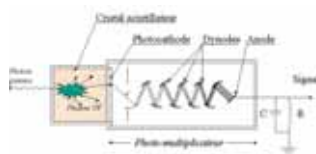
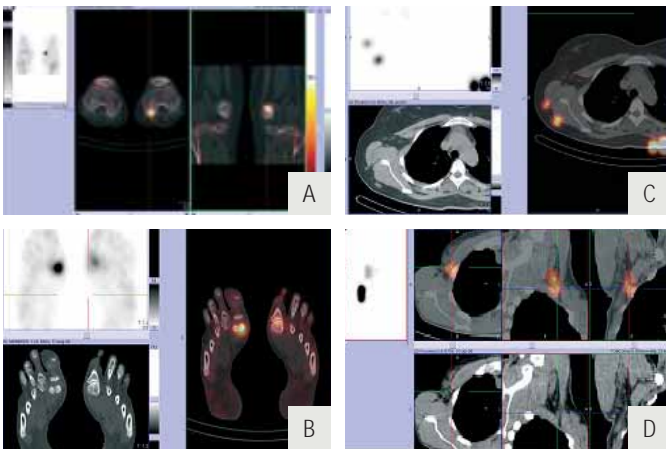


Diagram of the gamma camera's detection principle



Full-body scintigraphy



Examples of tomographic scintigraphy coupled with a CT scanner

A bone tomoscintigraphy of the knees, **B** feet, **C** tomoscintigraphy to detect a sentinel node for a melanoma, **D** tomoscintigraphy to detect a sentinel node for a breast.

The CT scanner has a twofold use since it makes it possible, on the one hand, to have an anatomical reference for better localization of scintigraphic uptake and, on the other hand, to adjust the attenuation of gamma rays through the patient's body, since some of the photons emitted from inside the human body are blocked.



The CT scanner's functionalities provide for helicoidal (or spiral) acquisitions, and allow fusion of 3D images between tomoscintigraphy and computed tomography. **A**: SPECT/CT 3D reconstruction for the feet in a frontal view; **B**: profile; **C**: profile in radiographic mode.

Some PET/CT images

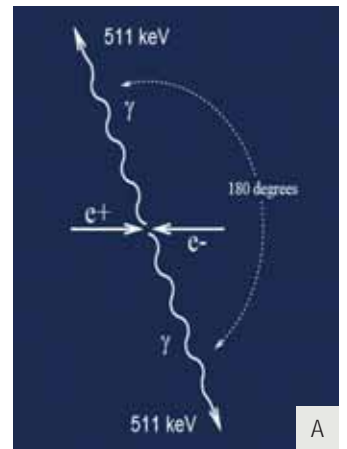
Operating principle

Detection of the line of emission is obtained from the emission in opposite directions of two gamma rays of 511 keV resulting from the annihilation of a positron from the emitting radioisotope (Fluorine-18) injected to the patient and a



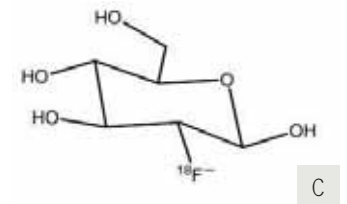
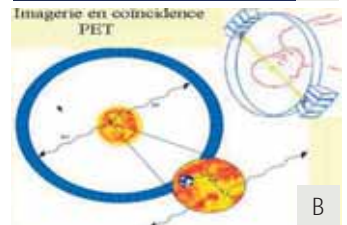
Since 2001 the Nuclear Medicine Department has the second PET/CT camera set up in Europe.

random electron from the body (fig. A). The emission line of the two gamma rays is possible only thanks to two detectors placed face to face and performing measurements in coincidence; this is electronic collimation. All the response lines representing the projections provide for tomographic reconstruction of the 3D image of uptake of the radioactive tracer (figure B).



The tracer used is 18-Fluoro-Deoxy-Glucose (FDG) (figure C), a marker of glucose metabolism.

Tumoral cells are characterized by increased consumption of glucose. The result is an accumulation of 18-FDG in tumoral cells and in certain glucose-hungry organs (brain, heart, kidneys, bladder).



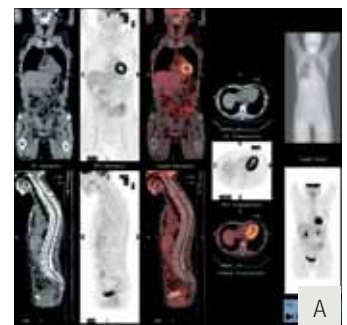
Examples of positron emission tomography coupled with a CT scanner

A Example of a normal PET/CT examination

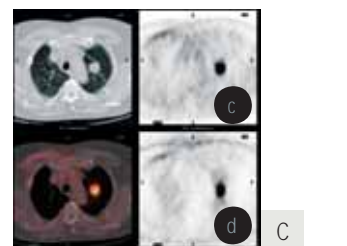
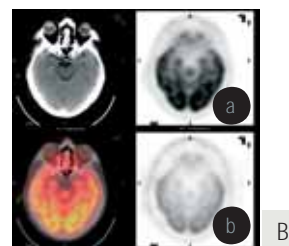
Radiographic visualization obtained with a CT scanner

B PET/CT brain examination

C PET/CT examination of a lung with uptake on a left lung tumour. We can remark on the two images, B and C, the implication of the correction of attenuation between images A and B and between C and D.



Cine-type visualization of positron emission tomography



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Prospects

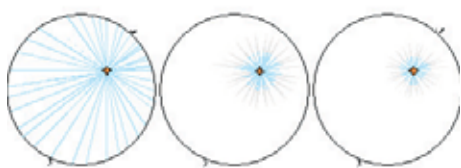
The new-generation PET/CT that will be replacing the current PET/CT in the Nuclear Medicine Department in early 2009 will include a system limiting the kinetic blurring on images due to patients' breathing movements.



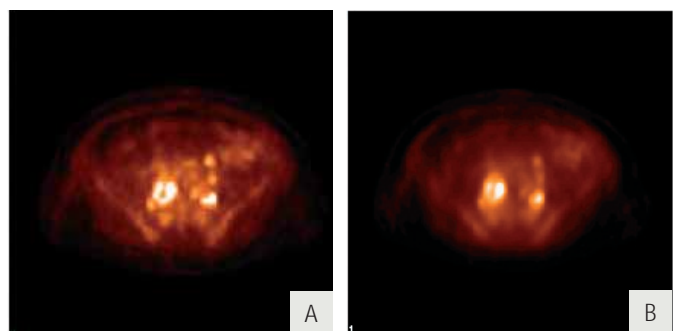
Images a and b show the contrast is improved thanks to synchronization with the patient's breathing

Temps de vol

Effet de la résolution temporelle des systèmes temps de vol



< The response lines are thinner and become segments when the temporal resolution improves, from 1 ns to 650 ps.



Another improvement in PET/CT technology is the temporal resolution of the detectors' coincidence window. Indeed, reducing it turns a response line into a segment. In fact, this technological feat implies measuring the photon's time of flight (propagated virtually at the speed of light) between the annihilation point and the two detectors. This results on image noise reduction and consequently a better signal-to-noise ratio.

These last images **A** and **B** show the advantages of the time of flight.

> Radiotherapy

The Radiotherapy Department is directed by Dr Michel Héry, with Dr Nicole Guiochet as Deputy Department Head. The medical physicists are Vicy Ma Soc and Benjamin Serrano who describes the treatment for us.

Apparatus

Radiotherapy treatment is ensured by a linear electron accelerator providing for radiation with:

-Either an electron beam with energy of 4 or 6 or 9 or 12 or 16 MeV according to the depth of treatment. Treating mainly a surface or low-depth area (skin cancer or ganglia...);



Linear electron accelerator for medical purposes



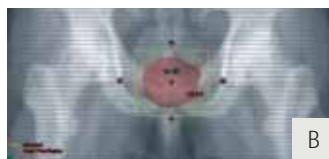
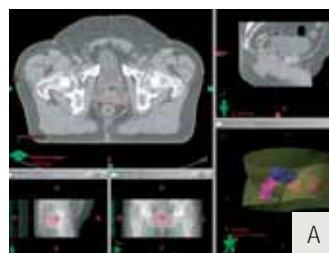
Wide-field-of-view CT scanner dedicated to treatment simulation

-Or a 6 or 25-MV photon beam with two energy points for in-depth treatment (prostate, lung cancer...).

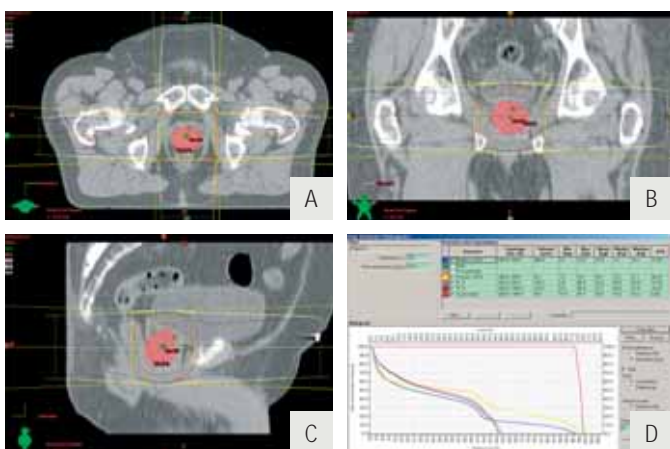
Preparation of treatment involves the simulation CT scanner, simulating the accelerator and patient's positions. Computed tomography has specificity for radiotherapy: a large diameter enabling access for retaining fixtures.

Some images

During acquisition of tomodensitometric images, structures are detected and traced. Here, for example, in a case of prostate cancer, the target volume is the prostate and organs 'at risk': the rectum, bladder and femoral heads. Figure **A** shows the different organ traced in virtual simulation. Before virtually positioning the first beam ballistics for the treatment, a set of margins is added to the volume of the prostate (target volume). These margins are defined according to the organ's movement, the tumour's microscopic extensions (not visible on CT images) and errors in the patient's positioning on the treatment table. Figures **B** and **C** represent the anterior and right lateral irradiation fields of the prostate + margins (volume in red). A final margin is added for the beam penumbra, the zone where radiation is not homogeneous.



Multiblades 5 mm thick at the isocentre (blue lines in figures **B** and **C**) of the accelerator collimator help better conform to the projection of the tumour following the irradiation axis.



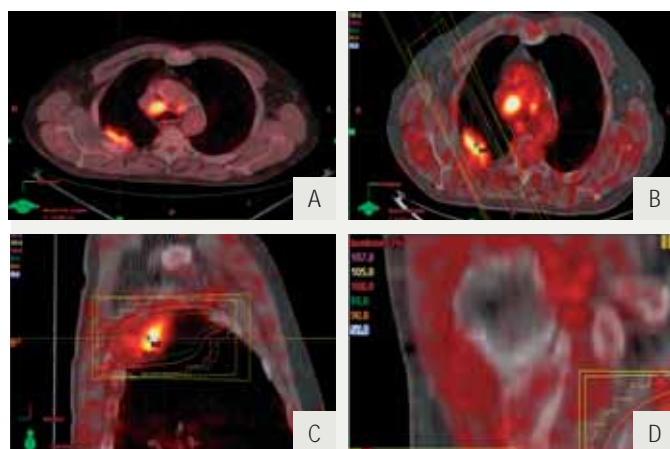
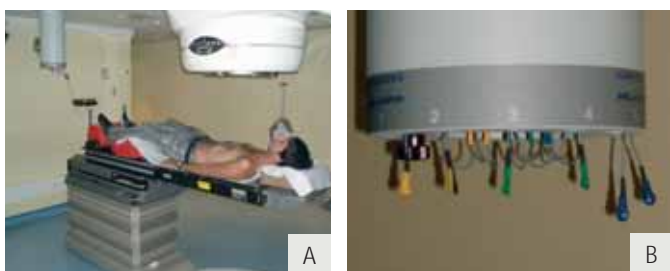
The next step is calculation of the distribution of the dose (energy per unit of mass) in the human body. For that purpose, a Treatment Planning System (TPS) simulates irradiation of the human body. The following figures **A**, **B** and **C** represent distribution of the dose in the human body for irradiation of the prostate. Figure **D** represents a dose volume histogram for the target volume and organs at risk.

Once treatment begins, the next step ensures proper implementation: control of the patient's position from 'portal' imaging on the linear accelerator. This system is made of amorphous silicon to take a radiological photograph from the photons generated by the accelerator.



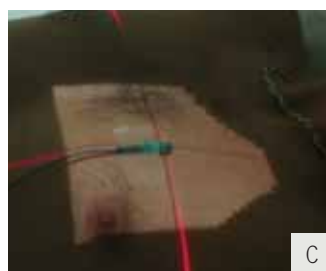
This figure shows, on the left, the reference position obtained by virtual simulation and, on the right, the patient's position during treatment. The concordance is perfect.

A second verification providing a further guarantee of proper administration of treatment takes place in the first treatment session or after any changes in treatment: this is a direct measurement of the patient called in vivo measurement.



> Imbrications of PET/CT imaging in radiotherapy

The use of PET/CT images in radiotherapy has become primordial to refine the target volume and implicitly the ballistics of treatment. This is illustrated in figures **A**, **B**, **C** and **D** where this lung tumour's irradiation field is better defined.



Figures **A**, **B** and **C** show the positioning of a diode in an irradiation field during the first treatment session. This measuring instrument checks that the starting dose corresponds to the expected dose during simulation of irradiation in the TPS.

CENTRE HOSPITALIER PRINCESSE GRACE (CHPG)



PR ALAIN PESCE



CAP FLEURI



> Geriatrics and gerontological coordination

The evolution of the Geriatrics Department's offering in terms of care and accommodation at the Centre Hospitalier Princesse Grace is intended to lead to adaptation of treatment facilities for the elderly to demographic evolution by providing continuity between the home, the medico-social sector and the healthcare establishment. The project includes hospital facilities with the creation of a geriatric programme, and a medico-social programme, represented by the organization of home care, gerontological coordination and the development of retirement homes and specific care for patients with Alzheimer's disease.

The system set up must address not only the increasing numbers of elderly people, especially over 75 years old, but also satisfy their specific needs and problems including multiple pathologies, social isolation, fragility and loss of autonomy, which affects 7% of people over 60 years old.

Elderly patients must benefit from a continuum of care, with advancing age and the onset of acute diseases or the evolution of chronic diseases, physical accidents and family incidents, to ensure the lack of 'loss of chance' and put off the onset or aggravation of dependence.

"The centre of the healthcare world is each sick person, whose existence must be known to be subsequently recognized." (P. Lucas)

The steps in the project

Assessments were made before drafting the proposal for a department and for home care of the elderly. First, in the Geriatrics Department, for a care improvement approach, building on existing initiatives, creating new orientations, organizing the treatment of patients according to current standards and according to the client population. Thus, the Geriatrics Department was created, comprising units for prolonged stays in hospital and Le Cap Fleuri retirement home. Then, with the population of the Principality of Monaco, on the basis

of demographic data, then data collected in the field by the CCGM (Centre de Coordination Gérontologique de Monaco). The results were reported to our supervisory organizations, in order to obtain their approval for the construction of the general project, integrated with the Principality's health policy, the guideline being to work simultaneously on setting up a hospital geriatrics programme and improving homecare.

- Step 1: working more closely with the mobile unit for palliative and supportive care. This approach was one of the first to be proposed in the project for a department, according to current recommendations. It seems natural to provide quality and professionalism with the oldest patients, by nature, the ones most confronted with end-of-life problems. Similarly, the contribution of geriatric culture and know-how could only be positive for this unit, whose ties with the Geriatrics Department have become effective for several years.

- Step 2: bringing together home hospital care (HAD) and home care (SAD), followed by significant development of home care (from 25 to 40 beds, and moving towards home nursing care) and home hospital care (now at 10 beds). The main beneficiaries are patients leaving the hospital. To improve care for people already at home and who are losing their autonomy, and on the initiative of Health and Social Affairs Department, the project for a new department that would be complementary for home care is being studied.

- Step 3: gerontological coordination. The CCGM (Centre de Coordination Gérontologique de Monaco) was created in September 2006. This structure is intended to assess needs, set up and evaluate plans for assistance and ensure coordination of home players. Beyond these missions, the CCGM can observe the population's needs, sets up actions for prevention and information and training for staff in case of a major event (heat wave, epidemic...).



CENTRE SPERANZA ALBERT I (LEFT, ABOVE AND RIGHT)



It is responsible for defining aid for the allocation of a «Special Benefit for Dependent Elderly Persons». The CCGM also coordinates a health network that is being set up.

- Step 4: Speranza Albert II day therapy centre.

This establishment is part of the city's geriatrics programme and the programme dedicated to Alzheimer's disease. Its vocation is to accommodate for one or two days a week patients living at home, to relieve caregiver and provide customized care. Created around patients' needs, it privileges three orientations: maintenance of social ties, relationship with the body and working on memory. Many interdisciplinary workshops are proposed to help fight such symptoms as apathy and anxiety, predominant in this disease, as a complement to drug therapy.

- Step 5: retirement homes.

In 2008, the Principality's only retirement home was Résidence du Cap Fleuri, a structure with 122 beds located in Cap d'Ail, France. It is a highly medicalized establishment that can deal with serious pathologies, with permanent 24hrs/day care. The site offers 80 beds for medium and long hospital stays. The capacity is very far from satisfying current needs. The aging of the population concerned, morbidity and greater dependence make it more today a place for care than for living, until the Centre de Gériatrie clinique opens. The opening of a new retirement home in Monaco, named A Qietüdine, is scheduled for 2009-2010. This medicalized establishment with 70 beds is intended for elderly people with medium dependence and will be a place for living, open on the historic La Condamine district with hotel services and high-level security.

- Step 6: the creation of a hospital programme, the Centre de Gériatrie clinique (CGC). This establishment will offer a graduated response to the need for geriatric care, whether programmed or not. Moreover, geriatrics care in hospital must satisfy needs in terms of palliative care, care for Alzheimer's patients and participation in onogeriatric treatment. The CGC is a building with 210 single rooms under construction on the site at the CHPG, entirely dedicated to care

for the elderly and scheduled for completion by mid-2010.

It will include complete hospital services:

- geriatrics consultation: this will help obtain rapidly a specialized opinion and orientation in the care system, to assess the degree of dependence, programme check-up in a day hospital or a short hospital stay, prepare institutionalization...;
- the day hospital (HDJ): traditionally for diagnostic and therapeutic purposes, the day hospital will also be oriented towards standardized gerontological evaluation (EGS). The concept, widely used by the CCGM for home care, can propose in-depth autonomy check-ups. This helps optimize estimation of needs in the home, and also benefit from advice on health education, prevention, and therapeutic observance. The EGS is also a tool in the service of the other disciplines, making it possible, with a serious evaluation of functional reserves, to propose appropriate therapy to beneficiaries, in order not to suffer from 'loss of chance' in case of successful aging and adapt therapy in other cases. Patients and caregivers can also find support for health education (nutrition, falling, osteoporosis...), prevention of iatrogenic risk and observance of treatment;
- short geriatric stays (30 beds): it will take in patients over 60 years old and especially after age 75, from their homes or from emergency care and other specialities, for stays that are programmed or not. In direct contact with homecare structures, the mobile geriatrics team and other elements in the hospital programme, this unit will serve as the hub for hospital care for the elderly. It will more specifically target elderly patients with multiple pathologies, complications and comorbidities of Alzheimer's disease, geriatric infectiology and treatment of neurological and vascular problems. This unit will complete the other CHPG short-stay units and enable them to refocus on their own disciplines, while remaining open, as should be the case, to specific care of organs in the elderly;
- geriatric follow-up care (30 beds): after a stay in another medical or surgical speciality department to pursue treatment, this care will

CENTRE HOSPITALIER PRINCESSE GRACE (CHPG)



THE FUTURE CLINICAL GERONTOLOGY CENTRE: SCALE MODEL



THE FUTURE A QUIETUDINE RETIREMENT HOME

promote a return home or reorientation. This will facilitate access to the other specialities by freeing beds earlier;

- the Alzheimer unit (30 beds): the evolution curve for this disease shows that there are some 870,000 patients in France and 140,000 new cases a year. By extrapolation, it is possible to estimate the number of cases in Monaco at 400 or 500, but this number will increase in future years. Treatment will not rely on a single Alzheimer centre, but, here again, on the notion of a programme, associating geriatrics, psychiatry, neurology (hence the 'neurological' orientation, among others, for short stays), as well as all the other specialities, so Alzheimer's patients do not suffer 'loss of chance' in therapeutic decisions. Nonetheless, dedicated units remain indispensable to accommodate outpatients and comorbidity, to pool expertise in somatic and psychogeriatric areas. This unit will be secured, with protected access, private gardens, footpaths for patients to enjoy the freedom and coming and going safely as they please;

- long-term care units (4 units with 30 beds): these units, to be distinguished from retirement homes, will receive elderly patients with considerable loss of autonomy and/or suffering from chronic (degenerative nerve diseases, sequelae of vascular accidents...) or non-stabilized diseases, or terminal, requiring major medico-technical care and long-term hospitalization;

- the mobile gerontology unit: it will develop cross-cutting expertise in geriatrics, providing support to teams in assessing needs and in therapeutic strategy. It will rely on the existence of active short stays in geriatrics.

The project offers many strong points:

- a holistic vision of geriatrics adapted to a defined area of intervention: the patient is at the centre of concerns;
- functional ties and complementariness between the different structures guided by a project and common values, completed by the

creation of a geriatric health network to open hospital service to the city;

- centralization of the hospital programme on a single site;
- complementarity with the other departments, Psychiatry and Functional Rehabilitation in particular, but also in the choice of disciplines represented: geriatrics, internal medicine, clinical infectiology, vascular medicine, neurology, algology and palliative and supportive care in particular;
- the quality of the architectural project and capacity of accommodation;
- the possibility, thanks to the CGC and the proximity of the CHPG, technical support centre, of developing top-quality care while preserving patients' quality of life as much as possible;
- the will to provide elderly patients, within the hospital programme, with the best therapeutic advances - for Alzheimer's disease in particular - thanks to a clinical research unit in the CGC;
- aid provided to other specialities, in particular in view of setting up the new T2A tariffs, where the advantage of efficient downstream services is well known.

The common element in these different structures for home care, hospitalization, retirement home, is that they all share the same values based on the quality of care, a holistic approach and respect for each individual's project for life.

Professor Alain Pesce



THE CENTRE CARDIO-THORACIQUE

> twenty years in 2007



Since its foundation, the Centre Cardio-Thoracique de Monaco has processed over 50,000 patients, performed over 48,000 exploratory acts and/or invasive cardiology, and nearly 17,000 operations, including over 14,000 with open-heart surgery. Some 1,600 children have been operated here. If the number of operations has grown from 750 to 950 a year since its foundation, the number of catheterizations is stable, at about 2,600. Since the year 2000, however, the number of non-invasive exploration by magnetic resonance (MRI) and scanner has doubled.

The CCM's specificity is to be a medico-surgical centre, where, of course, the continuity of care is ensured 24 hours a day, 7 days a week; cardiologists, cardio-thoracic and vascular surgeons, intensivists and anaesthetists, using for their patients the same beds, the same staff, the same facilities, in the same ward and intensive care sectors. This economy in the number of 'sectors' helps optimize the choice, quality and renewal of equipment and the number of nurses in the patients' service (example: Each bed is a complete autonomous unit as far as staff -one nurse for each operated and artificially assisted patient- and equipment -respirator, monitoring, lighting, aids and drugs- are concerned.)

Although provided with the equipment and staff to treat all cardio-thoracic and vascular problems, paediatric and adult, the principle underlying the CCM is 'small is beautiful', or rather 'efficient'.

The CCM has only 23 modular rooms offering a possible capacity of 47 beds, all equipped for eventual cardiothoracic and vascular intensive care, not including those of the permanent intensive care unit.

The CCM also respects one of its founders' basic principles: never separating cardiology and pneumology from cardiac surgery and thoracic and vascular surgery.

Moreover, the CCM has practised, since it opened in 1987, tariffs according to a package price per patient, and applies a period of guarantee for care and possible rehospitalization in relation with the pathology treated there: one month for investigations, six months for interventional cardiology and a year for surgery.

The main purpose of this autonomous medico-surgical centre is to provide patients in the French Riviera-Liguria-Piedmont region with high-quality care in the field of cardio-vascular and thoracic pathology. Its structure enables use of the same technical services, hospitalisation area, intensive care facilities and equipment for medical and surgical cardiology and post-operative care to treat both adults and children suffering from all cases of cardio-thoracic and vascular pathology, even the most severe, such as neonatal emergencies and terminal stages of cardiac insufficiency.

The Centre has also campaigned, since its creation, for the real cost of diagnostic and therapeutic procedures to be closely controlled in order to guarantee the health authorities a fixed price for each procedure.

The Centre has an agreement with the Monegasque health authorities based on the application of a fixed price for each pathology, and fulfils a public service role in conjunction with the Centre Hospitalier Princesse Grace. The medical expenses of the majority of the patients hospitalised at the Centre are covered by their State or private health insurance schemes.

Diagnosis, treatment and daily care are provided by a permanent team comprising:

Cardiology : Dr François Bourlon and Dr Filippo Civaia, assisted by Dr Michel Sabatier and Dr Philippe Rossi in clinical cardiology and diagnosis.

Anaesthesia and intensive care : Dr Françoise Montiglio assisted by Dr Dominique Fourquet and Dr Bruno Gostoli.

Surgery : Professor Vincent Dor and Dr Armand Eker, Dr Philippe Coste for extra corporeal circulation and circulatory assistance; Dr Claude Mialhe for vascular pathology. This team is reinforced by regular visits from Professor Gilles Dreyfus for adult cardiac surgery, Professor Jan Quaegebeur and Dr René Pretre and Dr Yves Lecompte for paediatric surgery and Dr Giancarlo Viglione for vascular pathology.

Furthermore, major vascular surgery essentially for treatment of aorta aneurysm, whether at the thoracic stage (conjunction of cardiac and



vascular surgery) or the abdominal stage (increasingly by using percutaneous endoprotheses) is a regular activity of the Centre under the responsibility of Dr Claude Mialhe, well known as one of those promoting these techniques.

The conjunction of invasive cardiology, vascular surgery opening access routes that are impossible for cardiologists and/or radiologists alone, cardiothoracic surgery and intensive care provides the most appropriate medical, surgical or hybrid treatment for each case discussed collectively.

Thus, the Centre Cardio-Thoracique has become a key element in the health facilities of Monaco. Its location helps attract patients from Europe, as well as the Mediterranean Basin and the Middle East.

Cardiologists on the permanent staff are satisfied to have, in addition to standard catheterization rooms, the three tools indispensable for cardiology: a mixed angio-surgical room, a MRI console permanently available for cardiology, a Dual Source angio-scanner entrusted more specifically to Filippo Civaia, Philippe Rossi and Jean-François Robillon. These facilities are at the disposal of physicians from Monaco and neighbouring communes to enable them to perform exploration on their own patients.

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A cardiologist's conviction

Vincent Dor was born in 1932 in Marseille, where he attended Medical School. Appointed Professor of thoracic and cardiovascular surgery in 1965, he discovered true cardiac surgery in 1966, at Stanford, with Norman E. Shumway. In 1972, he founded the University of Nice Department of Thoracic and Cardiovascular Surgery at the Institute Arnault Tzanck in Saint-Laurent-du-Var.

In 1984, aware that cardiology can be practised effectively only within an establishment structured to provide patients and physicians with all the technical means of exploration, invasive, endoluminal or open procedure and resuscitation, he obtained permission from the Monegasque authorities to create such an entity in the Principality with a permanent team and its facilities open to interested international practitioners.

He had a very rich career behind him when he resigned from all his academic and hospital functions and titles in 1987 to take over medical supervision of the Centre Cardio-Thoracique of Monaco, an autonomous medico-surgical hospital. He had created the Centre with Jean Desideri (administrator), Charles-Jean Schmeltz (architect), and his colleagues Françoise Montiglio, François Bourlon and Michel Sabatier for the integration, within a single permanent team, of the disciplines of anaesthesia-resuscitation and adult and paediatric cardiology.

In 1989, a mixed room for angiographic exploration and surgery was built, for the practice of all invasive acts of cardiology and, in all tranquillity (with support from trans-oesophageal ultrasound), endoluminal implantation of thoracic and abdominal aortic prostheses (nearly 400 to date).

A Somatom magnetic resonance console, intended solely for cardiothoracic pathology, was installed in 2002 under the responsibility of Dr Filippo Civaia, first cardiologist getting the degree M.R.I. specialist in cardiology.

Since the Centre was founded, Vincent Dor has published and presented abroad many lectures on his group's experience with cardiac surgery under cardiopulmonary bypass without blood transfusion and surgical reconstruction of ischemic heart failure. Similarly, many presentations outside illustrate the interest of non-invasive exploration of the heart, especially by magnetic resonance (Dr Filippo Civaia), or interventions on congenital malformations, for which the surgical treatment of the past is now replaced by using shunts, percutaneous prostheses obturating abnormal communication (Dr François Bourlon).

THE CENTRE CARDIO-THORACIQUE

> Cardio-paediatrics



DR FRANÇOIS BOURLON

Since it opened, the Centre Cardio-Thoracique has always treated children suffering from cardiac malformations, either with the permanent team, or by calling on experts from Paris (Dr Yves Le-compte), Switzerland (Dr René Prêtre) or the United States (Dr Jan Quaegebeur). These three practitioners are particularly qualified to perform surgery on complex congenital malformations in newborns, as in children and adults.

For emergency neonatal care, the CCM is certified with the paediatrics and neonatal resuscitation departments at the teaching hospital of Nice and regularly deals with neonatal distress cases complicating congenital cardiac malformations. The Centre has earned a special reputation, particularly for the Ross procedure, which involves replacing the aortic valve by children's own pulmonary valve, with implantation in pulmonary position of a human valve. This very risky procedure is performed even in newborns, with very satisfactory results. It enables children to grow with their valve without anticoagulant treatment that is always very hard to handle in this age group.

Humanitarian action

The Centre's humanitarian action relies on a long chain. Usually, the children come here thanks to the Association Rencontres Africaines de Cannes that selects children in Africa, handles transport by air in association with Aviation sans Frontières, and brings the children to the Centre Cardio-Thoracique. This association includes families of volunteers to provide accommodation during their stay in our region.

This action receives considerable financial support from many Monegasque charity organizations (MAP, AMADE, Monaco Red Cross, Princess Grace Foundation, Order of Malta, Zonta Club). This aid helps pay for consumables needed to perform these operations. The Children & Future association organizes a footrace every year at the Port of Monaco to gather funds that are generously donated to the Centre Cardio-Thoracique.

Training of physicians

There are also many individual volunteers who help take care of the children. Another aspect of humanitarian action is represented by the teaching provided to physicians who come to Monaco for training. At present, two main orientations are developed: one in Mauritania with the construction of a small centre for performing exploration and surgery on patients there; the other in Casablanca, Morocco, where a connection was established with Les Bonnes Œuvres du Cœur association, which already performs exploration and provides surgical treatment for children with congenital cardiopathy.

The Centre Cardio-Thoracique's role

At present, some 60 children under age 15 are operated every year. In addition, there are procedures involving interventional catheterization (closure of abnormal communication, opening of valves, dilation of certain blood vessels). In all, some 130 to 140 patients are treated annually at the Centre Cardio-Thoracique.

Another activity, prenatal cardiology, has made tremendous progress in the past two decades, with diagnosis of malformations and rapid treatment of newborns who have been screened.



CENTRE D'IMAGERIE MÉDICALE DE MONACO (CIMM)



DR MICHEL-YVES MOUROU AND DR JEAN-MICHEL CUCCHI

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The CIMM (Centre d'Imagerie Médicale de Monaco), is an example of the complementary nature of the public and private sectors to which many patients are strongly attached. The cooperation between the CHPG and the CIMM functions perfectly, declares Dr Michel-Yves Mourou, and helps keep patients in Monaco. Overall, between those who live here, those who work in Monaco and the nearby population, 100,000 people benefit from medical imaging in Monaco. Except for interventional radiology, which is one of the flagship activities at the CHPG, the CIMM can deal with all imaging needs.

Founded more than twenty years ago by Dr Michel-Yves Mourou and Dr Jean-Michel Cucchi, the CIMM, located in the Fontvieille district, processes over a hundred patients a day.

The CIMM is a private centre housing the utmost modern medical imaging technologies.

Its facilities include in particular:

- a Philips MRI 1.5 (Tesla Release 2.6). This new magnetic resonance device was installed in September 2008, and features the latest technological updates particularly for mammary imaging;
- a Philips Brilliance 40 CT scanner for all current diagnostic indications;
- dental exploration provided both by scanner and a new digital Planmeca panoramic X-ray unit;
- an osteodensitometry machine, indispensable for detecting osteoporosis and recognized today for its importance in therapeutic screening and surveillance;
- conventional radiology apparatus with new dynamic flat-panel sensors since October 2008. This facility realizes all exploration (ostearticular, digestive, urinary, pulmonary, internal genital);
- two latest-generation Toshiba Xario XG ultrasound machines for all ultrasound indications, including a special module for Doppler ultrasound;

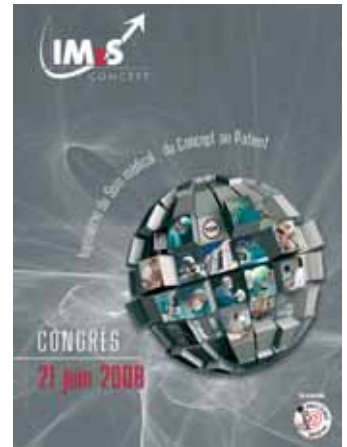


- breast exploration is performed using digital apparatus and an interventional mastology room (punctures with ultrasound, mammotomes, detection...), as well as another latest-generation digital mammographic room with tomosynthesis (installed in the fourth quarter of 2008/ one of the first in France).

In recent years, mammary exploration ranges from digital mammography to biopsy, including MRI. In Monaco, screening for breast cancer has been possible for over fifteen years; this is also true for osteoporosis (which is not reimbursed by the national health insurance).

Overall, the Centre d'Imagerie Médicale de Monaco satisfies the needs of a large number of patients seeking a private structure of the finest quality that suits their habits.





Medical tradition and therapeutic modernity



The IM2S spirit is the art of combining different kinds of know-how, medical tradition and therapeutic modernity with rigour, imagination and humanity to achieve the best-quality care for everyone.

All members of the Institute's medical, paramedical and administrative teams are the guardians of specific professional assets: hospitality, daily presence and concern with detail.

They know the rites and customs that transform the simplest service into privileged moments. This is an art; it is their talent, their profession.

Their desire to give the best of themselves to share it and their will to go back to basics make the IM2S one of the key players in health in Monaco.

In addition to its efficient ethical approach to medical care, the Institute strives to institute training on various themes through meetings, EPU's or surgery broadcast live.

This creates a major axis of development for the Institute and its practitioners.

The entire medical team is mobilized around this project and will be happy to exchange, share and bring its support to developing the organization of conventions in the Principality.

Dr Philippe Ballerio > IM2S Director General

The Institut monégasque de médecine et chirurgie sportive has been active since February 2006. Adjoining the Centre Cardio-Thoracique, it is located on Avenue d'Ostende, overlooking Port Hercule.

Its ultramodern rooms, air-conditioned and perfectly insulated, enjoy a view on the Port and the Rocher.

The Institute is dedicated to osteo-articular medicine and surgery, and is open to everyone, whether or not they engage in sports, by offering expertise on three levels:

- preventive advice to improve performance;
- indications for medical or surgical therapy;
- rehabilitation or readaptation

The IM2S medical team is made up of permanent or regular physicians, knowing that foreign physicians may be called in for specific operations. The IM2S technical support centre has five operating theatres, a post-operative care room with eight beds, imaging dedicated exclusively to osteo-articular problems (digital Rx, open MRI, ultrasound, osteodensitometry).

Activity clusters

- Surgery and anaesthesia: knee, ankle/foot, shoulder, hip, spine, elbow/wrist/hand, veins.
- Sports medicine and traumatology:
 - consultations for muscle and joint pain:
 - specific tests: stress test, isokinetics, shock waves, electromyogram, medicalized retraining, osteodensitometry.
- Rehabilitation: balneotherapy, Huber, massage box, physiotherapy box, rehabilitation room, bodybuilding room, cardio-training room + setting up of medicalized rehabilitation 7 days/wk
- Imaging: digital imaging, open MRI, ultrasound, osteodensitometry
- Podology.
- Nutrition-Dietetics.
- Emergency traumatology care 7 days/wk.



Medical organization

- Osteo-articular surgery

Dr Enrico Arnaldi > Shoulder, knee: meniscus, ligament

Dr Philippe Ballerio > Traumatology, hip, knee

Dr Julien Cazal > Hip, knee, ankle, foot

Dr Jean-Pierre Franceschi > Hip, knee: prosthesis, meniscus, ligament

Dr Nicolas Jacquot > Shoulder, hip, knee: arthroscopy, prosthesis and ligaments

Dr Bruno Lussiez > Elbow, wrist, hand

Dr Michel Maestro > Foot, ankle, hip, knee

Dr Bernard Massini > Neurosurgery, spine

Dr Abdou Sbihi > Hip, knee: prosthesis, meniscus, ligament

Dr Bernard Schlatterer > Knee, hip, foot, ankle

- Venous surgery

Dr Sylvain Chastanet

Dr Paul Pittaluga

- Anaesthesia Algology

Dr Xavier Maschino > Anesthésiste-réanimateur

Dr Thierry Ould > Anesthésiste-réanimateur

- Consultation in sports medicine and traumatology

Dr Stéphane Bermon

Dr Jean-Marc Parisaux

Dr Jean-Louis Brunetto

Sports medicine (doping, nutrition...), sports traumatology (shoulder, spine, knee...), osteopathy, manual medicine

Dr Gian Carlo Rafferri > Traumatology and sports medicine, osteopathy

- Emergency traumatology care

Dr Philippe Repiquet and Dr Cécile Bertrand

Emergency traumatology care, sports traumatology

- Phytotherapy

Dr Jean-Jacques Campi > Clinical phytotherapy, osteopathy, manual medicine

- Medical imaging/MRI

Dr Jean-Michel Cucchi

Dr Michel-Yves Mourou

Dr Giuliano Michelozzi

- Ultrasound

Dr Patrick Coudert

- Osteodensitometry, rheumatology

Dr Jean-Louis Brunetto

- Doppler ultrasonography

Dr Olivier Rousset

- Functional exploration centre

Dr Jean-Marc Parisaux > Isokinetics, posturography

Dr Stéphane Bermon > Cardio-respiratory and metabolic tests

Dr Jean-Louis Brunetto > Electromyogram

Hervé Belleguie > Medicalized rehabilitation

Jean-Philippe Ringwald > Osteopathy

- Sports podology, posturology

Florent Audat > Sports podology, posturology

- Dietetics, nutrition

Séverine Olivié > Dietician, sports nutritionist



Research and innovation

Research and innovation form a major area of development for the IM2S. This cluster works on new technologies, highlighting medical and surgical advances in the Principality and abroad.

The IM2S enjoys equipment and facilities for hosting medical meetings regular year round. For example, a forty-seat meeting room on the top floor is equipped for audio and video connections with the operating rooms.

It is thanks to these modern facilities that the IM2S can regularly organize various meetings and training sessions.

Live surgery

Since the start of 2008, one Saturday a month, an operation is broadcast live from the operating room to the meeting room. The purpose of this original idea is to show the various surgical operations practised daily, along with innovative techniques.

In May 2008, the orthopaedic surgeon Dr Ronan Treacy, from the Royal Orthopaedic Hospital in Birmingham, showed new therapy for osteoarthritis in a young athlete: Birmingham hip resurfacing (BHR).

Postgraduate teaching

EPU's are organized several times over the year. These training sessions bring together practitioners around topical scientific and medical subjects.

Conventions

The IM2S organized its first congress on 21 June 2008 on healthcare engineering: from the concept to the patient. The aim of the meeting was to present medical papers addressing health engineering issues. The IM2S Congress will be held annually; the second is scheduled for 6 June 2009.

Computer-assisted surgery for total knee replacement

Dr Bernard Schlatterer describes below the advantages of this system for certain operations.

The navigation system functions on material surgical navigation platforms for more accurate surgery, as in positioning knee implants and anterior cruciate ligaments. It combines information on the patient's anatomy pre-operative statistical knowledge. Thus, the operation adapts to the patient's anatomy. Alignment of the morphotype (Fig. 1 and Fig. 2) and the precise orientation of prosthetic implants are essential factors for preserving from polyethylene wear for greater longevity of the prosthesis. Recent studies comparing the results of computer-assisted total knee replacements with those in a control group implanted using conventional instrumentation showed better radiographic results in the 'navigated' group. The value of navigation lies essentially in better aligning each implant in the frontal plane in reference to an optimum 90° mechanical implantation axis. The work station includes cameras emitting infrared signals and receiving those emitted by reflective markers on the surgeon's tools, so the surgical instruments' position can be seen 3-dimensionally in real time. The system assists the surgeon in setting up the operation with accuracy to less than one millimetre and the possibility of a less invasive approach. This navigation system is used without pre-operative image acquisition.

- The operation begins by setting up a femoral and tibial referential system fixed on each skeletal part.
- The definition of skeletal markers helps in positioning implants. The distal and tibial femoral section plane remains perpendicular to the mechanical axis.



The latter is defined by 2 points (example of the femur):

- the centre of the femoral head is obtained by kinematic acquisition. The femoral skeleton's circumduction movements are made from a pivot point corresponding to the centre of the femoral head. The scatter plot traced by the femoral referential system models a sphere whose centre is computed by an algorithm;
- the distal point is obtained by placing the tip of a navigated probe at the top of the intercondylar notch.

To check rotation, a second axis is set up from the top of the digitized posterior condyles. The third axis is defined by the vectorial product of the other two.

- bone morphing involves reconstructing the patient's epiphysis in 3D (equivalent to a preoperative scanner) by kriging the generic model on the basis of surface acquisitions obtained during the operation. Automatic computation of the most distal and most posterior points is performed after digitization of the condyles. The application of a navigated plate on bone sections makes it possible to check their accuracy. Mobility and alignment of ligaments and final alignment of the lower limb are checked after trial implants.

We chose to equip the Monegasque Institute with a portable nano station for several reasons:

- miniaturization of the station to make it easily portable;
- maintenance service providing regular software update;
- this navigation system functions with several software programmes for use in total knee prostheses, corrective osteotomy, shoulder prostheses and pedicular screws for spinal surgery.

The knee is one of the main joints involved in sports traumatology.

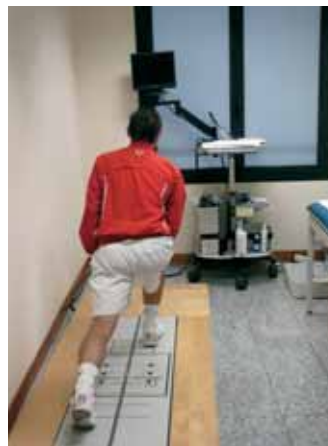
Dr Philippe Ballerio, the IM2S director, has entrusted me with full-time responsibility for structuring this around an already very efficient team. Meetings and publications should soon express the importance of this clinical activity.

Dr Bernard SCHLATTERER > Orthopaedic and traumatological surgery



© CENTRE DE PRESSE

CENTRE MÉDICAL INTERNATIONAL DE MONACO (CMIM)



BALANCE MASTER



EQUITEST

The **Centre Médical International de Monaco (CMIM)** is a multidisciplinary medical centre founded in 1998, located in Athos Palace, a prestige building in Fontvieille. It is characterized above all by a top-level medical team, working both in private practices and in other institutions (Centre Hospitalier Princesse Grace, Association Sportive de Monaco). The specialities represented are otorhinolaryngology, ophthalmology and sports medicine. The staff is completed by an orthoptist, an optometrist, a physiotherapist and a psychologist.

The medical staff has a cutting-edge technical support centre, which places it on a par with the finest European teaching hospital departments. Without being exhaustive, we can mention:

- in ENT: exploration of the auditory system, computerized video-nystagmography, computerized stabilometry on Equitest platform, video-endoscopic exploration of the upper aerodigestive tract, laryngeal videostroboscopy, laser and radiofrequency treatment...;
- in ophthalmology: automated visual field, ocular ultrasound, fibre-optic analyser, OCT, digital angiography, treatment of the retina using different laser devices and intravitreal injections in a dedicated room, video-oculography, computerized dynamic visual acuity tests, electroretinography...;
- in sports medicine: 3D colour ultrasound, a computerized exploration platform for static and dynamic proprioception, realization of intra-articular injections of growth factor...

Besides activities specific to each of the medical specialities represented, the CMIM has developed high-level cross-cutting activities in different areas. We can mention in particular:

- postural and equilibrium disorders: exploring vertigo and equilibrium disorders benefit from the complementary competencies of each player in the centre, whether these equilibrium disorders concern athletes (proprioception, vision...), the elderly or persons suffering from inner ear problems. Over the years, the CMIM has

acquired a strong reputation in this area that extends to the Alpes-Maritimes département in France and Liguria in Italy;

- language disorders in children: since hearing and vision are indispensable for language acquisition, the team has quite naturally focused for many years on specific disorders in written language, more often described as dyslexia and dysgraphia. Today, the Centre's ENT specialists, ophthalmologists, orthoptists and psychologists pool their efforts to help children with these disorders by using the most efficient evaluation and treatment tools (auditory and visual sensory tests, search for postural deficiency syndrome, postural and neurovisual rehabilitation, prismation, platform rehabilitation, psychotherapy...). This activity is developing today by networking with other players in the Principality and the Alpes-Maritimes addressing children's language disorders (teachers, speech therapists, clinical psychologists).

Alongside this exploratory activity and treatment, the CMIM staff very regularly organize postgraduation classes, meetings and conventions. A multidisciplinary staff in thyroid pathology has also been held regularly for several years. A research programme on written language disorders is about to be launched.

- Docteur Pierre Lavagna, ENT, Department Head at the CHPG
- Docteur Sandrine Canivet, ENT, Deputy Department Head at the CHPG
- Docteur Jean-Marc Riss, ophthalmologist, Deputy Department Head at the CHPG
- Docteur Yasmine Ounnoughene, ophthalmologist, former Senior Registrar at Les Quinze-Vingts (Paris)
- Docteur Philippe Afriat, Sports Physician, ASM football team
- Faustine Lepoivre, Orthoptist



MONTE-CARLO LIFE CHECK (MCLC)



DR MICHAEL MC NAMARA



SCANNER

In the Principality of Monaco, **the Monte-Carlo LifeCheck (MCLC)**, a preventive diagnosis centre founded by Dr Michael Mc-Namara, was the first on a European level to provide a complete health check-up in one hour. It continues to do so today, thanks to such very high-technology medical body scanning devices like the General Electric VCT 64-slice scanner and the EchoSpeed 1.5 Tesla MRI. This equipment is routinely updated every several months or even completely replaced with newer generation scanners to improve MLCC performance.

The EchoSpeed 1.5 Tesla MRI provides painless high-resolution images of the heart and carotid arteries, and can make early detection of prostate and female organs (uterus, ovaries). It also helps in the early detection, without X-rays, of breast cancer with MRI mammography, which today is the most accurate way to detect breast cancer. MRI is also indicated for high-resolution analysis of all the joints in the body (knee, shoulder, hip, ankle, hand).

For the basic examination that lasts only about an hour, patients remained clothed and no injections are required. The procedure is painless. Only virtual colonoscopy requires preparation of the colon one day prior to the scan. Very reliable and well tolerated by patients, this examination detects polyps and tumours, but without the risks associated with conventional colonoscopy, and without pain, since no probe is inserted in the body. It is important to remember that, at present, colon cancer is the second most common cause of mortality from cancer after lung cancer, and only early detection of polyps helps reduce the risk of developing such cancer.

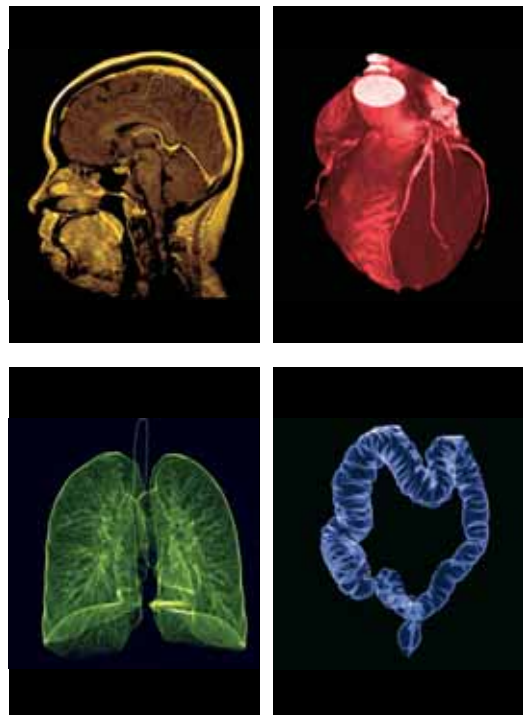
The Monte-Carlo LifeCheck check-up also includes a complete blood test, which covers all of the main blood analysis parameters, including lipid cholesterol profiles for heart disease risk assessment and tumor markers which may help in the early detection of cancer.

The Monte-Carlo LifeCheck facility has a staff of nine employees, plus two physicians ready to assist colleagues wishing to learn about this type of preventive check-up, during a convention, for example. The

Monte-Carlo LifeCheck has also set up a medical tourism programme combining a leisure stay on the Riviera and a preventive diagnostic health check-up.

A second MLCC centre, similar to the Monegasque concept, has been established in Moscow, in the city's most luxurious hotel, The Ritz Carlton, located just a few metres from the Red Square. This concept of medical tourism fits in perfectly by combining the beauty of the center of Moscow and the extensive professional experience of the medical staff, the most competent in the area of health assessment by medical imaging.

MLCC



THE CENTRE D'HÉMODIALYSE



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© CHPM

The **Centre d'Hémodialyse Privé de Monaco - CHPM** was founded in 1988 by a nephrologist, Dr Henry Fitte, to provide the Principality of Monaco with a structure specialized in the treatment of terminal chronic kidney failure. The CHPM belongs to the 2nd French health operator, the Vitalia Group, since 2007.

The CHPM receives patients with chronic kidney failure and visitors year round and offers 19 haemodialysis stations with cutting-edge generators and production of pure osmotic water by double high-performance reverse osmosis. With some 15,000 haemodialysis operations a year, the Centre treats a hundred or so chronic patients

from Monaco and the Alpes-Maritimes.

The medical team is run by the physician and Director Dr Henry Fitte, surrounded by co-workers. The physicians from the Centre Hospitalier Princesse Grace (CHPG) practise there by convention. The healthcare, technical and administrative staff is made up of thirty people.

The CHPM works with private and hospital structures in the Principality of Monaco as well as the Teaching Hospital (CHU) of Nice Pasteur and Hospital of Menton, in particular for transfers, hospitalization and kidney transplants.



Askamon: this name, which associates Asclepius, the god of sport, the 'A' of 'athlete' and 'mon' of Monaco, stands for an innovative idea, an IT solution for medical data for top-level athletes. The idea came to Dr Patrick Coudert, a sport physician for the Monte-Carlo Series, who submitted it to Prince Albert II in 2005.

The principle is simple: using the Internet and data centralization to consult, at any time and in any place, an athlete's medical file, prescriptions, reports, correspondence and prior X-rays/MRIs particular. Rather than keeping the information on an athlete with a particular physician, it is hosted remotely, thereby creating a valuable statistical tool for research and especially for coordinating care. Everything is recorded, from diagnosed injuries to prescribed treatment. The time saved is considerable; furthermore new tests can be avoided. Physicians, as well as physiotherapists, nutritionists, physiologists, chiropodists... have access to the file thanks to specific access, permanent or temporary, according to their rights.

Askamon has to main competitors worldwide, in Australia and in Canada. But, according to Dr Patrick Coudert, Monaco has the advantage of being in Europe has having the confidence of Europeans, while maintaining close ties with the English-speaking world, ideal geopolitical neutrality.

Askamon signed the first agreements during the Games of the Small States of Europe in 2007, as well as the Monte-Carlo Masters Series and Roland Garros tennis tournaments, then with the AS Monaco soccer team, the National Football League, the French national soccer team (professionals and hopefuls), the Basketball and Handball League. Discussions are obviously underway with other leagues and federations.

Technically, Askamon relies on the Click & Store™ principle to avoid using the keyboard in favour of mouse clicks. Financially, a subscription is invoiced to each athlete, although in practice the cost is covered by the organizations.

This solution appeals to many players in the world of sport, including athletes and the medical corps as a whole along with healthcare auxiliaries.