Project of early detection of gastric carcinoma
Hospital Max Peralta, Cartago, Costa Rica
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1. Introduction

Costa Rica is a fascinating country, in more than one aspect. Beside the beautiful nature and friendly inhabitants, there is also the alarming fact of the high incidence and mortality rate of gastric carcinoma. Of all types of cancer, gastric carcinoma in Costa Rica has the highest mortality rate.

All in all, the country offered enough reasons for two Dutch medical students to want to spend some time there, and with the help of prof. Salvador Peña, it was possible for us to organise a practice in gastroenterology. We were to spend time in the laboratory of the University of Costa Rica, which is called INISA, “Instituto de Investigaciones en Salud” (National Institute of Research in Health).

In Costa Rica we worked under the supervision of Dr. Rafaela Sierra at INISA, in San José. She introduced us to a PhD student who explained the interest the group of INISA has in the determination of \( IL-1 \) gene polymorphism in gastric cancer. This interest was based on the recent publication in Nature showing an association of \( IL-1B \) gene polymorphism and gastric cancer (See later for references).

Apart from this, we spend some time in the Max Peralta hospital of Cartago. In all of Costa Rica, the province of Cartago is the place where the incidence of gastric cancer is highest. Therefore, the Max Peralta hospital was chosen as the location for the Project of Early Detection of Gastric Cancer. Here, we could get an idea of how the project has functioned in practice.

1.1 Costa Rica

Costa Rica was discovered in 1502 by Christopher Columbus. Seeing the gold decorations worn by some of the natives, he expected to find gold and silver in the region. Therefore he named it ‘Costa Rica’ which means ‘rich coast’. In fact what the first colonizers found, instead of gold and other riches, were hostile Indian tribes, almost impenetrable jungle and various tropical diseases. For this reason, it took the Spaniards until the 1560s before they could form a permanent settlement in the central highlands (1), where the climate is more temperate and the soil fertile. The imagined riches of the country turned out to be few and after they were plundered, Spain lost interest and left the first settlers to survive on their own. This seems to be the main reason why the Costa Rican people are a very homogenous group, genetically speaking. (1) Another reason is, that in Costa Rica there was never a large community of indigenous people. This gave the settlers little chance for mixed marriages, which were very common in other areas of the Americas. Today, of the almost four million inhabitants, only approximately thirty thousand belong to the indigenous tribes (less than 1%), and the African-Caribbean population, mainly concentrated in the Atlantic Coast around the Port of Limón, forms an approximate two percent of the Costa Rican society. (1)

In our days, Costa Rica is a country that is well known among tourists because of its beautiful beaches, national parks and nice people. It lies in the Central American isthmus, bordering Nicaragua to the north and Panama to the south-east.

Within Latin America, Costa Rica has been named ‘the Switzerland of Latin America’. This name refers to the amounts of tourists the country attracts and its relative prosperity. Compared to other countries in Central America, Costa Rica has always been a peaceful country. There has been one civil war in 1948, and after that, the country even became the only nation in the world that does not have a national army. (1) Although most countries in the region have been disturbed by several coups and revolutions, Costa Rica, supported by the United States of America, remained an island of peace.
Thanks to the support of the United States and the relative political tranquillity, Costa Rica has developed into one of the most prosperous countries in all of Latin America. This gave the government the financial means to establish a solid system of social security. From the 1950s they adopted the view that the well-being of the population is a precondition for economic progress and the responsibility of the government itself. This was the start of a period of active economic interventionism. In the following decades, government social services have been maintained and extended as a conscious attempt to preserve social peace. (1)

By the 1970s, the government was investing high percentages in social and health care programmes. This policy was expensive, but successful: towards the end of the 70s, the government spent over 50% of their budget on social services, and the number of Costa Rican families living in poverty had declined from 50% in 1950, via 40% in 1971, to 25% in 1977. The average life expectation at birth was rising, illiteracy and infant mortality were declining. Nowadays, infant mortality is 11.8 per one thousand live births, the literacy rate is of an impressive 95.2 percent and life expectation at birth is 76 years. By comparing these figures with data from neighbouring Nicaragua, a country plagued by revolutions and civil war until as far as the eighties of the last century, one can understand what they mean. In Nicaragua, infant deaths are as high as 54 per one thousand, and life expectation at birth is only 63 years. (1)

Between 1970 and 1980, the mortality rates of infectious diseases declined by 98%, thanks to nation-wide vaccination campaigns. In medical terms, the country presents characteristics of both the first and the third world. As in developed countries, the incidence rates of cardiovascular disease and type 2 diabetes are rising. In fact cardiovascular disease is presently the number one cause of death in the country, followed by malignant tumours. Meanwhile, typical poverty related diseases such as parasitic infections are still widespread and the number of teenage pregnancies is disconcertingly high: reports are made of 37 % of the mothers at maternity ward being under 18. (2)

Already in 1941, the Social Security Service was created (see below), which has expanded to reach as much as 84% of the Costa Ricans.

However, from 1980 onwards, Costa Rica has suffered the declining of the economical welfare, and has cut in the budgets for social services and health care. The government has had to acknowledge that the subsequent rise in gastrointestinal diseases, alcoholism and drug dependency are directly attributable to the economic crisis and decaying social conditions. From 1987 to 1992, the number of Costa Rican families failing to meet their basic needs has risen from 21 to 28%. In December, 1994, the vice-president Rebeca Grynspan estimated that 35% of the families lived in poverty, and 21% in extreme poverty. (1) The most recent percentages on this date from 1999, when 20.6% of Costa Rican families lived in poverty. However, this number cannot be compared with previous data, as the criteria for ‘poverty’ have changed. (2)

1.2 The Costa Rican health system

The Costa Rican health system can, in its quality, in Latin America only be compared to the Cuban system. As mentioned above, from 1941 onwards, the Costa Rican government has done much to improve the health system, first by introducing the Social Security, and more recently by creating the EBAIS (Equipo Básico de Atención Integral en Salud), the primary health care practices (see appendix 2). The Social Security owns hospitals and EBAIS and is also the employer of all of the personnel.

Apart from this, the state insurance is also paid by the Social Security. The state provides health care insurance for people that cannot work, for example elderly people and disabled people, and also for people who are unemployed or earn wages beneath a certain amount. This system ensures health care for people who cannot afford to pay for it themselves.
At this moment though, there is discussion in Costa Rica about the cost of the health care system, as the price of solidarity is weighing heavily on the budget of the government. Of course, there are also many private hospitals. Upper class people go there to avoid the long waiting lines that are common in the hospitals owned by the Social Security. Although techniques may be more advanced in private hospitals, and there is more attention to surrounding the patient with all modern conveniences, the Social Security hospitals are by no means second rate, the best doctors like to work there, not only because of altruism, but also because the Social Security pays very well.

2. Project of Early Detection of Gastric Cancer

2.1 Epidemiology

Compared to the Netherlands, Costa Rica has a very high incidence of stomach cancer (table 1). During the period of 1990 until 1996, it has occupied the second place in incidence in men, and the fourth place in women according to the Costa Rican National Tumour Registration (RNT). Because stomach cancer is a relatively silent illness, that does not cause complaints until the tumour has become very large, the mortality rate is also very high (table 2). During the last three decades it has been the most mortal cancer of all in Costa Rica. World wide, Costa Rica occupies the fourth place in incidence and mortality rates among men, and the sixth, respectively third for women. The countries with the highest incidence rates are Japan, Korea and Ecuador (tables 1 and 2).

Japan, a country with startling high incidences of stomach cancer, has developed a screening program to detect early gastric cancer, in stages where it can still be cured and lives can be saved. As a result of the program, mortality rates dropped in Japan, and the idea arose to start a similar project in Costa Rica. In Japan at this moment, the detection rate of early gastric cancer is 50% and the five-year survival rate is approximately 60%. In Costa Rica, these numbers were quite different: of all detected cases of stomach cancer only 7 to 10% were classified as early stages, and the five-year survival rate was a mere 15%. The higher mortality rates in Costa Rica are mostly due to late detection, but it is probable that therapy was also less advanced than it is in Japan. Therefore, it seemed likely that implementing the Japanese methods of detection and treatment in Costa Rica would help produce a similar rise in five-year survival rates as seen in Japan.

In 1994, serious plans were being made for an intensive co-operation between the two countries. On February 28th of the year 1995, a contract was signed by the Costa Rican Social Security (CCSS), the Japanese International Co-operation Agency (JICA) and the University of Costa Rica (UCR), confirming the realisation of a 5-year project of early detection, diagnosis and treatment of gastric cancer. The Japanese government donated $10 million and the CCSS invested $1.1 million in the project and additionally, both parties invested in materials and personnel. The project was multidisciplinary and involved various disciplines such as double-contrast x-ray, endoscopy, pathology and surgery. The objective of the study was ‘to establish a mass detection system for the early diagnosis and treatment of gastric cancer to reduce the mortality rate for this disease in the Costa Rican population.’

2.2 Immunogenetics IL-1B gene polymorphism and gastric cancer

Screening, care, and cure make up the greatest part of the project for early detection of gastric cancer, but also an effort is made to enlarge our knowledge of the disease and its causes. After all, only by knowing the aetiopathogenesis of the disease a permanent cure can be achieved. Part of this scientific research is aimed at the role of IL-1B gene polymorphism in the development of gastric cancer. Recent publications in Nature and Gastroenterology have shown an association between the two.
The role of *Helicobacter pylori* in the development of gastric cancer has been suspected since the bacterium was first discovered in the early 1980’s but active infection could not always be found in gastric tissue of cancer patients. In the 1990’s this dilemma was solved with the recognition that chronic infection with *H. pylori* induces hypochlorhydria and gastric atrophy, both of which are precursors of gastric cancer.(10) The irreversible damage can have its effect long after the initial infection is over.

Infection with *H. pylori* can lead to very diverse and apparently paradoxical clinical presentations, the most extreme being, gastric ulcer, duodenal ulcer, and gastric cancer.(11) However, most patients develop no significant clinical disease in spite that gastritis is almost always present. It has been proven that *H. pylori* virulence factors play an important role in the determining process, but they can not fully explain why the ulcer or the gastric cancer phenotype develops. Host genetic factors seem to offer the most plausible explanation for the difference in clinical outcome.

Acid secretion capacity is of major importance in the distribution and natural history of *H. pylori* infection. If acid secretion is sufficient, inflammation will be found mainly in the antral region. Inhibition of acid secretion, pharmacologically or otherwise, leads to corpus-predominant gastritis, predisposing for gastric atrophy and thus forming an important factor in the aetiology of gastric cancer. (8)

It has been suggested that the interleukin (IL)-1β gene plays an important part in this process, for it has a strong pro-inflammatory effect, it is up-regulated by the infection. Further, it is the strongest acid secretion inhibitor presently known.(9) The *IL-1* gene cluster presents a number of functionally relevant polymorphisms, which are suspected to correspond to higher or lower levels of IL-1β production, which made a case-control study possible. In their study of a white population of gastric cancer relatives, Machado et al. found a positive relation between high IL-1β, hypochlorhydria and gastric atrophy. In an attempt to link the pro-inflammatory *IL-1β* genetic polymorphisms to gastric cancer another case-control study was performed, comparing gastric cancer patients to healthy controls. The results confirmed the positive association between these genotypes and gastric cancer of the intestinal type as well as the diffuse type. The association of the *IL-1B* gene polymorphism with similar outcomes of *H. pylori* infection across geographic and ethnic differences underscores the key role played by IL-1β in the cascade of events leading to gastric cancer.(8)

In the classical gastritis-atrophy-intestinal metaplasia-dysplasia-carcinoma sequence described by Prof. Pelayo Correa (12), IL-1β plays an important role in the first step. However, further development does not occur in all cases. This suggests that a proinflammatory host genetic makeup facilitates the development of a hypochlorhydric, atrophic phenotype that increases the risk of gastric cancer, but the ultimate neoplastic transformation is dependent on many other genetic and environmental factors.(8)

Investigations have been performed in various countries, including Portugal and the United States, and now it is being investigated in Costa Rica as well.

### 2.3 Methods

The Cartago area was chosen to start the project, as the highest incidence rates are reported here.(7) For practical reasons, the population covered by the Max Peralta hospital in the city of Cartago was selected to participate in the project. Here, a centre was built and equipped with financial and material support of the JICA (Japan International Co-operation Agency). Japanese doctors, scientists and other professionals were sent to work with the Costa Rican staff for a period between one and three years. Among them were specialists in the fields of gastroenterology, radiology, surgery, nursing and pathology. They worked together with the local crew to help establish the Japanese system of detection, classification and treatment of early gastric cancer.

The main idea of the programme is to perform a mass-screening of the population at risk. In this study, the population selected were between 50 and 74 years of age, because this group presents the highest incidence rates. (4,7) Surprisingly, 100% of the men and only 50% of the women in
this age group were invited. The scientists explain this selection by stating that it is based on the historical distribution of presentation of gastric cancer, it being twice as frequent in men as in women. (4)

The selected subjects received invitational letters and the project was also promoted in the regional health centres (EBAIS) in an attempt to reach as many people as possible. All patients presenting themselves at the centre of early detection of gastric cancer are presented with a questionnaire regarding, for example, symptoms of possible stomach pathologies, co-morbidity, level of education, family history and external risk factors such as smoking and consumption of alcohol. (see appendix 1)

After the patients fill out the questionnaire and have their personal file entered into the computer, they are seen by the x-ray specialists, who, in Costa Rica, are not medical doctors, although they do have full responsibility of performing and evaluating the exam.

The oesophagus, stomach and duodenum are then visualised by means of high-resolution double-contrast x-ray techniques. (4) The results are closely examined and a preliminary report is written for further evaluation in the multidisciplinary session which takes place in the afternoon.

Patients with suspicious findings in their x-ray study are re-examined by high-resolution upper GI tract video-endoscopy. (4,6) For this exam, they are requested to arrive with an empty stomach. Local anaesthesia is used: lidocaine is sprayed into the patient’s throat and then swallowed. The endoscopist searches especially for small superficial cancers, which present themselves most commonly as a slight depression with irregular margins, often with colour changes. If there is any surface irregularity, indigocarmine solution may be sprayed on to reinforce and amplify the visual expression, thus helping the endoscopist to distinguish between benign and malign lesions. (6)

The results of all endoscopies realised in the morning are discussed in the afternoon multidisciplinary session. If necessary, images can also be shown.

2.4 Results

In the year 1996, a total of 2100 gastro-duodenal x-rays were performed in participants of the project. (7) As the centre was inaugurated March 20th of the same year, this means an average of approximately 230 exams monthly. Of all the participants, almost one out of every three was referred for gastroscopic study (691 persons, 32.9%) and 32 of them were also evaluated by ultrasound. (7)

Between March 1996 and July 2000, a period of 51 months, a total of 12,723 x-ray gastro-duodenal series was performed, leading to the diagnosis of 80 cases of cancer (6.3/1000). In 53 of these 80 cases (66%), it turned out to be early gastric cancer as defined by the Japanese classification. (7) In previous national studies of the conventional system of detection of gastric cancer, a mere 10 per cent of the detected tumours was classified as early. (7) This obviously has great implications for the possibilities of treatment and the survival rates.

A total of 383 cases of gastric cancer were treated in the centre during this period, 80 of them being found through the mass screening system, and 303 referred to the centre after being diagnosed at a different location. (7) This means a total of 7.5 patients with cancer are seen in the centre on a monthly basis. This in itself quite startling number is an advantage for the centre’s medical staff, meaning that they can dedicate themselves solely to treating stomach cancer, thus enhancing their skills and providing them with the opportunity to refine their methods of surgery and care. Besides, it ensures a good educational climate, for medical students as well as for surgeons and gastroenterologists from other hospitals.

2.5 The future

Since the contract with the Japanese government expired in February 2000, the CCSS is taking total financial responsibility. Negotiations with the Japanese government to ensure further
support in the future are in full progress, while at the same time the co-operation and the booked results are being evaluated. The Project has been renamed the Centre for Early Detection of Gastric Cancer but basically continues to perform the same tasks as before. (7)
The Costa Rican government and the CCSS have defined three areas of particular interest for the centre to focus on. Therefore, three programmes have been developed: one for detection and treatment, one for education and research, and one for information and prevention. (7)
The programme for detection and treatment of gastric cancer still forms the main activity of the centre. It is aimed primarily at the population already included in the study, but also involves further evaluation and treatment of patients referred from other parts of the country. It is of vital importance to keep a clear administration of these non-project cases, as to identify areas of the country that show an increased incidence and thus a higher risk for gastric carcinoma. In the future, this will help to make a more accurate circumscription of the target population for mass screening. (7)
Teaching and research are bundled in another programme. A special team, consisting of an oncologic surgeon, a pathologist, an endoscopist and a nurse, is gathered to pass on the knowledge acquired during the years with the Japanese. (5,7) Special attention will be dedicated to the areas where a higher risk is suspected, as they will be identified by the detection programme. Professionals working in these areas will be trained to adopt the Japanese method of detection, their classification system and their treatment. Training is realised by inviting the local surgeons, gastroenterologists and x-ray technicians for a defined period of time to give them the opportunity to work in the Japanese system. Ideally, this new method will be implemented in hospitals throughout the country, though this might be difficult to realise as the director (a surgeon himself) of the centre recognises: it is not always easy to change the ways of surgeons, especially the more experienced of them.
To complete the centre’s range of activities, there is the programme for promotion and prevention. Promotion is used to bring information on gastric cancer under the attention of the general public. They will be made more aware of risk factors, protective factors, signs and symptoms of the disease, the advantages of early diagnosis, the principal carcinogenic agents and a healthy lifestyle and eating habits. It is therefore a form of primary prevention, by trying to change the people’s risk behaviour, as well as secondary prevention by stressing the importance of systematic screening to facilitate early detection. The public will not only be directly informed, but part of the centre’s efforts will be dedicated to educating the healthcare workers on primary and secondary level. This means that doctors and nurses working in the EBAIS and the regional outpatient clinics will be instructed to motivate their patients to participate in the mass screening programme. Also, learning more about the disease itself will make it easier for them to recognise it and, if necessary, they will know when and where to refer their patients. (7)
Table 1: Incidence of gastric cancer in number of patients per 100,000
Table 2: Mortality of gastric cancer in number of patients per 100,000
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Appendix one
Questionnaire as presented to patients participating in project of early detection of gastric cancer

1. What level of education have you completed?
   - Primary school, grade ...
   - High school, grade ...
   - University
   - Other, please explain ...

2. From which age did your family dispose of a refrigerator?

3. Do you presently use any medication? If you do, which?

4. Do you suffer from any of the following symptoms:
   - Heartburn
   - Pain in the upper part of the stomach
   - A full sensation
   - Nausea
   - Vomiting
   - Sensation of hunger or a hole in the stomach
   - Loss of appetite
   - Sensation of having a mass in the stomach
   - Weight loss
   - Black stool
   - Other discomforts of the stomach. Explain…..

5. Have any of your parents, children, brothers or sisters had:
   - Duodenal ulcer
   - Stomach ulcer
   - Stomach cancer
   - Oesophagus cancer
   - Cancer of the colon or rectum

6. Do you suffer from any allergies? Which of the following:
   - Fish or shellfish
   - Medicines
   - Pollen or grass
   - Dust
   - Milk
   - Others, namely…..

7. Has a doctor found any of these diseases in you:
   - Diabetes
   - Heart disease
   - Kidney disease
   - Hepatitis
   - Cancer
   - Tuberculosis
   - Asthma
   - Glaucoma
   - Hypertension
   - (only in men) prostate problems

8. During your lifetime, have you smoked more than 10 cigarettes?
At what age did you take up smoking?

9. Do you presently smoke?
   How many cigarettes a day? (a package = 20 cigarettes)

10. How many years ago did you quit smoking?

11. With what frequency do you drink alcoholic beverages?
   - Never
   - Occasionally
   - In the weekends
   - Every day or almost every day

12. And when you were 20 years old; With what frequency do you drink alcoholic beverages?
   - Never
   - Occasionally
   - In the weekends
   - Every day or almost every day
Appendix two
Report of the clinical practice

Week 1-3 : INISA

We started to work at the laboratory of INISA. INISA is ‘Instituto Nacional de Investigaciones en Salud’, or national institute of health research, that forms part of the University of Costa Rica.

We were to participate in an additional investigation of blood samples, taken from people participating in the Project of Early Detection of Gastric Cancer. The objective of this study is to analyse polymorphisms of interleukins in relation to infection with Helicobacter pylori.

The first week we needed to get acquainted with the techniques used in this laboratory, such as DNA-isolation techniques and the procedure of PCR. On Wednesday of week 1, we attended a meeting about the problems that had risen using the database used by the Japanese (in Microsoft FileMaker), especially in extracting data for epidemiological research. We were explained how to pass data from FileMaker to a new database in Excel. After this meeting, we spent the afternoons working on the computer, helping to pass data, belonging to the Project of Early Detection of Gastric Cancer, from FileMaker to Excel.

The second week, Eva took a blood sample of Lydia in order to practice DNA-isolation and PCR without having to use the Project’s samples. The isolation of DNA did not cause us any problems, as we had practised this with a similar procedure in The Netherlands.

The PCR, however, did cause us many problems during the second and third week. We assisted Warner in PCR with his samples, and all of us blamed the failure to obtain good results on the quality of the (old) blood samples. Unfortunately, we did not get any results with fresh blood either.

Week 4-5 : The EBAIS

In the following weeks, we would get an overview of the organisation of healthcare in Costa Rica. The EBAIS are the primary health care clinics, where people are seen by a general practitioner or a nurse, depending on their problem. EBAIS means ‘Equipo Basico de Atención Integral de Salud’. If a patient feels he needs to be seen by a specialist, he needs to be referred by the GP of the EBAIS he belongs to. An EBAIS is meant to serve about 2500 people, as there is only one doctor. It is not uncommon, however, that one EBAIS serves more than 5000 persons.

Apart from the doctor and the nurse and in some cases a dentist, every EBAIS has one ‘assistente técnico de atención primaria’ or primary healthcare assistant. This is an assistant with hardly any medical training (except for a six months’ course), who performs house visits to all the families corresponding to the EBAIS. These visits are routine visits. The owner of the house, or any other adult living there, answers questions about the number of inhabitants living in that house, the number of bedrooms, if there is potable water, if there is a proper sewage, etc. etc. Advice is given on how to prevent the spreading of infectious diseases, specifically Dengue fever, by measurements meant to help eradicate the carrier of the virus, the mosquitoes. Pressure is taken from every person over sixteen present, and women are explained the importance of having a Papanicolau smear taken at least every two years for early detection of cervical pathologies, and auto-examining their breasts every month. The técnico leaves medication to deparasitize the children between two and fourteen years old, and asks if there is need to leave anti-lice lotion. He also checks the vaccination status of the family and vaccinates at the spot if necessary. The visit is supposed to be annual, but if the area the EBAIS serves is extended, as in the poorer parts of the country, it is not possible to visit every house every year.
Eva spent two weeks in the EBAIS of Fatima and Lydia in Patarrá, both fairly poor neighbourhoods of Desamparados, in the southern part of San José. In the mornings, we accompanied the ‘técnicas’ to the visits. Both of us also participated in the big national vaccination campaign against measles and rubella, that reached its end a few days after we started in the EBAIS. In this campaign, not only schools were visited, but people on the streets were asked if they had been vaccinated, and if not, they were invited to be vaccinated right there.

In the afternoons, we reviewed the files of the patients of our respective EBAIS, and inserted the data found into a special database, to detect patients with a high risk of developing diabetes mellitus type II. This under supervision of dr. Adriana Laclé, who is currently investigating this subject.

**Week 6-9: Gynaecology in Limón**

Dr Zuricka Samuels, a gynaecologist-oncologist, has designed a program to screen for early cervix carcinoma. Cervix carcinoma is the second most common cancer in Costa Rican women, and as we were interested in cancer, we were invited to come to Limón and get to know her work.

On the day that we arrived in the Tony Facio hospital in Limón, we were presented to dr. Samuels, who immediately invited us to change into operating room uniforms and assist in several smaller surgeries. This start tells all about the three weeks we were to spend in Limón: as turbulent as fascinating.

Every morning, both of us joined dr. Samuels on her round at Gynaecology, where she would discuss the patients with us, and sometimes we examined them together. After that, one of us joined dr Samuels in consultation, while the other stayed upstairs at Maternity or Gynaecology. As dr Samuels is the only oncologist in the province of Limón, she sees every woman with an abnormal Pap smear from all over Limón. Usually, between 8.30 and 14.00 she sees about forty patients, most of them for control, after an abnormal Pap smear or after treatment for dysplasias of the cervix. In these patients, she takes a Pap smear, performs a colposcopic exam, and if necessary, takes biopsies. She also sees patients with suspicion of breast cancer.

Once every two weeks, a day is dedicated to ambulatory treatment of cervical dysplasias and ectropion. The first is treated with conisation by cautetisation, the second by cryology.

On Monday and Tuesday, the routine is different; these are the days that oncological surgeries are performed. Both of us have been present at several hysterectomies, one of them was a radical hysterectomy, ‘the mother of all surgeries’ as gynaecologists like to call it, because of the profound knowledge of the anatomy of the pelvis that is needed to perform this surgery with success.

Apart from the hysterectomies, we have also been present at surgeries on the ovaries, conisation performed with scalpel and some cystectomies of the breast.

On the days that there would be less oncological surgeries, we would attend the gynaecological surgeries, such as salpingectomies, curettaes and scheduled caesareans.

When dr Samuels was on duty for the night, we accompanied her until approximately midnight. In those shifts, she covers the Maternity department, and we had the chance to assist in both vaginal child births and caesareans. Sometimes, we accompanied the newborn baby and the neonatologist to the neonatology department, where we were explained how to revise the babies and what exams, vaccinations and preventive measurements are needed for both healthy and pre-term babies. We have seen births and caesareans of pre- and post-term babies, twins, babies in breeching presentation, and macrosomic babies, among other things.

In one of the night shifts, we attended to an emergency surgery on a young woman with severe abdominal pain ten days after a curettage because of a spontaneous abortion. She turned out to have an ectopic pregnancy in a Fallopian tube.

For both of us, our time in Limón was the first time we were allowed to assist in the operating room, and all the operations we have attended to were very educational experiences for us.
Week 10: Centre for early detection of gastric cancer, Cartago

This week we finally had the opportunity to visit the project about which we had read so much before coming to Costa Rica. The centre was bigger than we expected and the equipment was very modern, the influence of the Japanese co-operation was evident. However, for the amount of patients and controls seen on a daily basis, there is a great need to expand in the near future. Every morning, the waiting area would be replete with patients, and usually the endoscopists and the X-ray technicians had to work through their lunch.

The first day we were introduced in the X-ray examination room where all the participants of the project are thoroughly screened for anomalies in the oesophageal, gastric and duodenal region by ways of double contrast radiology. We were explained what characteristics to look for in the images produced on the screen and we compared the complaints, as presented by the patients, to the outcome of the examination. Though often difficult to interpret for untrained eyes, the images demonstrated many of the different diagnoses we had encountered in the database which we had been using during our first weeks at INISA. It was a very interesting process to see and the explanation, friendly provided by the X-ray experts, made the theoretical knowledge we had gathered on gastric pathology come to life.

We also had a look in the CAT-scan room, where patients from all hospital wards are seen. Originally, the CAT-scan was acquired by the Japanese to evaluate patients with stomach cancer only, but the lack of facilities in the rest of the hospital made the team decide to attend other patients as well.

In the afternoon, all the X-ray, CAT and endoscopy results of the morning were discussed and classified by a team of doctors and radiologists, in the presence of assistants and students. As was explained to us, this was a habit introduced by the Japanese, to give all participants the opportunity to learn from each other. For us, this was very educational for we could ask all the questions we wanted. The last activity of the day was a visit to the patients in the wards, most of whom had undergone partial or total stomach resections the days before.

On the second day, we joined the endoscopists in their work. Patients presenting anomalies in their screening X-ray are referred to them and are usually seen within two weeks. Also, GP’s in the region can refer patients directly for endoscopical examination. The patients receive topical anaesthesia by spraying of lidocaine in the throat, they are not sedated for the endoscopy. The whole procedure seemed rather unpleasant to us, but was performed by very experienced doctors. We could see clearly that the information gathered from the video images and biopsies is of vital importance for an accurate diagnosis.

We were present at one emergency endoscopy of a patient with bleeding oesophageal haemorrhoids. This was quite an impressive experience, as the patient went into a cardio-respiratory arrest during the procedure of ligating the, clearly visibly bleeding, veins. While the emergency team were on their way with the equipment, the doctors present at the scene performed CPR and did what they could. Finally, after several tries of resuscitating the patient with cardio version, she presented spontaneous heart action again, and could be transferred to intensive care. Unfortunately, she died later that day. Afterwards, the team of the Project of Early Detection of Gastric Cancer told us that an emergency like this occurred in the centre only approximately once every year.

Once a week, there is a pre-surgical meeting with all the specialists working in the centre. In this meeting, the final decisions are made on who to operate the next week, why, and what kind of surgery will be performed. The investigations and laboratory studies are completed and discussed, so that everybody has a complete view of the status of the patient. Once the team agree on the diagnosis and the technique of the surgery, it is scheduled, and the date will only be changed in case of an emergency.

On Monday and Tuesday, the centre’s surgeons spend their day in the operating rooms. These days we were invited to join the team in surgery and one of us would wash and join in, while the other would stand near the anaesthesiologist and watch. On both occasions, a total resection of
the stomach and several lymph nodes combined with a resection of the gall bladder was performed by two surgeons, assisted by a student and one of us. The anastomosis made was Billroth II with Roux Y construction, leaving two temporary drains behind to be used in case of post-operative complications such as leakage of the anastomosis. Also, a jejunal drain was placed, to be removed after two months of recovery. During surgery, several moments were dedicated to instruction and explanation for the student present, as well as for us.

More than once, the influence of the Japanese was emphasized by the Costa Rican specialists. For example, they explained to us that the Japanese specialists had taught them to call in the pathologist during surgery. Once the stomach is resected, the pathologist studies the macroscopic aspects of the lesion(s) and discusses his findings with the surgeons and students. This provides a possibility to confirm or reject the diagnosis, as far as this is possible without a microscope, and may help the surgeon decide whether he thinks it necessary to remove more lymph nodes than previously planned.

Once every week there is a meeting in the department of pathology, where the pathologists show the surgeons, gastro-enterologists and radiologists what their findings are in the stomach tissue and in the resected lymph nodes. All of them examine the samples together, taking measurements and commenting on the aspect of the tumour. This serves as a source of feedback for all doctors and radiologists working at the centre, comparing their conclusions, derived from pre-surgical exams, to the final diagnosis.

**One day in week twelve: The International Clinic**

As we liked to get an impression of the organisation of health care in Costa Rica, we were invited to a private clinic of a specialist in gastro-enterology, dr. Con Wong. In the International Clinic, we have been present at one gastroscopy, one gastro-coloscopy and three coloscopies.

The main difference with the hospitals owned by the Social Security was that in this clinic, patients are sedated for all endoscopic exams. In the International Clinic the anaesthetist and the gastro-enterologists were doing a study on a new method of sedating the patient very lightly, so that he is just unconscious enough not to remember anything afterwards, but he will regain consciousness within one minute while the exam is being concluded. This effect is reached by administering a combination of three different sedative drugs, which are metabolised more rapidly and require smaller doses compared to single-drug anaesthesia. The level of consciousness is monitored during the course of the exam by constant electro-encephalography obtained by placing three electrodes on the patient’s forehead. This way, the anaesthesiologist present can determine whether or not to administer additional sedation during the exam.

We were explained that sedation not only benefits the patient, but the doctor as well: the muscles of the intestines will be more relaxed, which allows the scope to pass smoothly. This makes it easier for the investigator to conclude the exam rapidly and without complications.
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