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# Pediatric orthopedic surgery in humanitarian aid

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## A B S T R A C T

Pediatric orthopedic surgery in humanitarian aid is conducted mainly in cooperation with emerging countries. Each mission is different, and depends on numerous parameters such as the country, the frequency of such missions, the pathologies encountered, the local structure and team, and the non-governmental organization (NGO) involved. Pathologies vary in etiology (tuberculosis, poliomyelitis) and severity. Each mission requires the presence of an experienced surgeon. Working conditions are often rudimentary. Surgical indications should be restricted to procedures that are going to be effective, with minimal postoperative complications, without any surgical "acrobatics". Teaching should be in association with the local university, and adapted to local needs. Mission objectives need to be realistic. Surgical indications should be adapted to local conditions, and the surgeon needs to be able to say "no" to procedures involving undue risk. The surgeon on mission should cooperate with local teams and be able to adapt to unusual situations. Assessment of results is essential to improving efficacy and evaluating the success of the mission.

### Keywords:

Humanitarian aid  
Pediatric orthopedic surgery  
Emerging countries  
Cooperation

## 1. Introduction

The concept of humanitarian medicine has a long history, studied by famous names and organizations – Henri Dunant, Albert Schweitzer, Eugène Jamot, *Médecins sans Frontières* ("Doctors without Borders"), *Médecins du Monde* ("Doctors of the World") – to name but a few, some being Nobel Peace Prizewinners.

For several decades, the number of humanitarian organizations has been growing, in the health field and also education, engineering, agriculture, etc.

"Humanitarian aid" has become a watchword, and perhaps a buzz-word. Although the term is well suited to situations of natural disasters or war, in pediatric orthopedic surgery the concept of cooperation missions with emerging countries seems more appropriate. However, we shall stick to the term "humanitarian aid", which is anchored in the public imagination.

Members of the French Society of Pediatric Orthopedics (SoFOP) are strongly involved in humanitarian medicine: over the last 10 years, 42 of them have taken part in 418 missions in 31 countries (Fig. 1) via 24 non-governmental organizations (NGOs).

The present article seeks to define the role of pediatric orthopedic surgery within humanitarian medicine, and to suggest strategies to optimize efficacy and utility.

We shall draw to a large extent on our own experience, which began 30 years ago when we were doing our National Service in the hospital of Ziguinchor (Senegal) and is now continuing in Myanmar and in Vietnam. We have performed 38 missions in all, in various countries (Senegal, Burkina Faso, Sri Lanka, Vietnam, Myanmar), under the auspices of various NGOs (*Médecins sans Frontières*, *Chaîne de l'Espoir*, *Children Action*, *Association Médicale Franco-Asiatique*, *Enfants du Noma*, and *Rugby au Cœur*).

## 2. Types of humanitarian mission

Three situations should be distinguished:

### 2.1. Natural disasters

Pediatric orthopedics plays a limited role in the emergency context as such, but may be called upon (as in the Haiti earthquake).

### 2.2. War

When armed conflict becomes chronic and intractable, pediatric structures break down and need replacing. This is the case of the Kabul pediatric hospital, set up by *Chaîne de l'Espoir*.

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**Fig. 1.** Humanitarian missions by SoFOP members in the last 10 years. List of countries: Afghanistan, Armenia, Bangladesh, Benin, Brazil, Bulgaria, Burkina Faso, Central African Republic, Chad, Côte d'Ivoire, Dominican Republic, Haiti, Iran, Jordan (Syrian refugee camps), Kenya, Laos, Madagascar, Mali, Mauritania, Mongolia, Morocco, Myanmar, Nicaragua, Niger, Nigeria, Palestine (Gaza), Rwanda, Senegal, Syria, Togo, Vietnam. List of NGOs: Aide Médicale et Développement, Amitié Coopération Franco-Laotienne, Association Amadou, Association Médicale Franco-Asiatique, Avlom Santé, Bénin Armor Santé Education, Chaîne de l'Espoir, Chaîne de l'Espoir Belgique, Children Action, Handicap Santé, Humaniterra, Friendship, Journée d'Orthopédie et Sentinelle, Les Amis Comtois des Missions Centrafricaines, Les Enfants du Noma, Médecins du Monde, Médecins Sans Frontières, Medicaero, Ninos Que Rien, Ordre de Malte France, Swissclinical, Swiss Connection, Terre des Hommes, World Federation of Hemophilia.

### 2.3. Assistance in emerging countries

Many emerging countries have good adult surgery facilities, and are seeking to develop pediatric surgery. It is in this situation that pediatric orthopedic surgery has its main contribution to make.

## 3. Mission parameters

Each mission is different, and depends on a range of parameters determining success or failure. NGOs need to adapt to local conditions and needs and not to remain fixed to some preconceived idea developed in Europe. This highlights the importance of assessment missions.

### 3.1. The country

Patients' pathologies and approaches vary depending on whether the mission is in Africa, the Middle East or South-East Asia.

### 3.2. Frequency of missions

A one-off mission is of limited usefulness. Intervention needs to be longer term, with clearly defined objectives.

When several surgeons are involved together, they need to develop a shared strategy, using the same treatments, otherwise they are going to undermine the local surgeons.

A relation of trust with the local team develops better when it is the same surgeons who keep coming back, enabling close cooperation between teams that have got to know one another.

### 3.3. Types of pathology

A mission may have a target program: burns sequelae, scoliosis, clubfoot, etc. Others cover the whole field of pediatric orthopedics.

Depending on the country, certain pathologies may be more frequent than others. In Bangladesh, for example, *Aide Médicale et Développement* (AMD) runs a special program dedicated to treating one particular form of rickets.

### 3.4. Local structure

Everything may be encountered, from a university hospital center to a little provincial structure. Depending on the structure and the means available, patient selection will be different. In some cases, the focus will be on basic surgery: tenotomy, simple osteotomy, etc. In others, more complex procedures will be feasible: congenital hip dislocation, spinal surgery, etc.

### 3.5. Local team

The local team may be closely involved in patient selection, intervention and follow-up, or on the contrary may be totally absent, raising the problem of postoperative care. In that case, the mission is one of replacement of a failed local system, and indications have to be restricted to simple cases without risk of complications.

### 3.6. The NGO

Some NGOs have plentiful means and permanent local coordinators to take care of logistics. Others have more limited means, and the surgeon may have to look after logistics, which obviously reduces turnover.

## 4. Are the pathologies encountered in humanitarian aid different?

Pathologies differ in etiology, severity and frequency.



Fig. 2. Progressive Pott's kyphosis in 8-year-old boy.

#### 4.1. Etiology

Etiological preconceptions sometimes need challenging. In a humanitarian mission, kyphosis is more likely to be Pott's disease than a congenital vertebral deformity. The humanitarian aid worker needs to have a basic knowledge of the classic conditions that our modern training tends to neglect. Tuberculosis and poliomyelitis are two such examples.

##### 4.1.1. Tuberculosis

Tuberculosis affects more than 30 million people worldwide [1]. Two million have vertebral involvement. Incidence is increasing in both developed and emerging countries.

Two to 5% of cases of tuberculosis are osteoarticular. In 90% of cases, location is spinal. The limbs are more rarely involved (10%), with clear lower-limb predominance (92%), mainly concerning the hip (45%) and then the knee (25%), with multifocal involvement in 20% of cases [2].

Tuberculous arthritis shows subacute or chronic progression, with aggravation leading to joint destruction and ankylosis. Diagnostic delay accounts for the extensiveness of the lesions. Clinical symptoms are fairly non-specific, associating pain, swelling, joint stiffness, functional impotence and sometimes cutaneous fistulization.

Spinal involvement (Pott's disease) is the most frequent cause of kyphosis. The tuberculosis involves the anterior segment of the spine in 90% of cases. It leads to vertebral collapse, graded in 3 types according to the destruction of 1 or more vertebral bodies [3].

After healing, Pott's kyphosis progresses in 40% of children (Fig. 2). It entails esthetic and psychological issues, but above all costo-iliac impingement, cardiorespiratory effects and progressive paraplegia [3].

The ideal treatment is prevention of deformity. In the acute phase, management is medical, associated to surgery in case of deformity. At the sequellar stage, osteotomy or in situ grafting may be considered, according to local conditions and risk (notably, neurological and respiratory). When intraoperative neuromonitoring is not available, only in situ fixation should be performed, however great the temptation to attempt correction.



Fig. 3. Genu recurvatum, sequela of poliomyelitis.

##### 4.1.2. Acute anterior poliomyelitis (AAP)

Despite vaccination campaigns, AAP has still not been eradicated, and there is even unfortunately resurgence in war zones where vaccination is scarcely feasible, such as Pakistan, Afghanistan, Syria or Iraq.

AAP is thus still on the agenda, but is a pathology not taught in the developed world. Mallet's article [4] and the recent article by Joseph and Watts can be very useful in the field [5].

AAP progresses through 3 stages: an acute phase, with purely motor palsy and no sensory impairment; the recovery phase; then finally a sequellar phase with residual palsies causing stiffness and deformity during growth (Figs. 3 and 4).

Treatment should be conservative at first, to prevent deformity.

At the sequellar stage, treatment of deformity is based on soft-tissue release, tenotomy and osteotomy.

Postoperative rehabilitation optimizes long-term results [6].





**Fig. 4.** Severe hip flexion contracture, sequela of poliomyelitis.



**Fig. 5.** A. Irreducible clubfoot. B. Surgical treatment with posteromedial release. Result at 1 year.

## 4.2. Severity

Pathologies tend to be more severe than in Europe, as they have usually not had treatment.

### 4.2.1. “Irreducible” clubfoot

This may be “virgin” clubfoot (Fig. 5) that has never been treated, or, even more difficult, recurrence of previously operated clubfoot.

In the context of a short-term mission, it is unrealistic to consider gradual correction by external fixator unless the local team can provide regular follow-up and a subsequent mission will pursue treatment.

Usually, treatment will comprise a single surgical procedure: posteromedial release for younger patients, fusion for older patients, or astragalectomy in some cases of arthrogryposis. Use of walking orthoses for 1 year reduces the risk of recurrence (Fig. 5).

The introduction of the Ponseti method has provided real progress and been the focus of some specific missions (see Section 5). Clubfoot sequelae are encountered much less often than 10 years ago.

### 4.2.2. Scoliosis and kyphosis

Early diagnosis and orthopedic treatment rarely happen, and we are often faced by severe scoliosis with Cobb angle over 90°. Scoliosis is often secondary, and kyphosis related to Pott’s disease.

These severe deformities are difficult to manage for several reasons: lack of preparation, rudimentary preoperative assessment, lack of neuromonitoring requiring systematic wake-up test, and unreliable surveillance and postoperative follow-up.

Without neuromonitoring, osteotomy is not recommended. In situ fusion, is preferable, being much less risky.

Cranial halo traction may be initiated by local surgeons 1 month ahead of the mission to ensure good preparation in case of severe deformity [7].

Management of secondary scoliosis requires special attention, especially when myopathy is suspected, with risk of postoperative respiratory complications that are difficult to control.

### 4.2.3. Bone and joint infection

Chronic osteomyelitis is frequent due to late or wrong diagnosis related to difficult health-care access and poverty. One is often confronted by pandothryseal osteomyelitis [8].

In case of severe bone remodeling, possible malignancy should not be overlooked and biopsy is recommended whenever possible [9].

Surgery consists in resection of soft-tissue and necrotic bone, sometimes requiring defect filling (Fig. 6).

Salmonella is frequent in some regions with endemic sickle-cell anemia, and may be mistaken for a vaso-occlusive episode related to sickle-cell anemia. Diaphyseal and multifocal locations are the most frequent [9].

### 4.2.4. Cerebral palsy

Eighty percent of cases of cerebral palsy occur in emerging countries. The number of referrals for cerebral palsy is regularly increasing and now exceeds that for poliomyelitis.

Cerebral palsy mainly affects the poorest populations, with little access to health-care. The cause is more often perinatal than due to prematurity. Clinical presentation differs, with a higher rate of dystonia and lower rate of spasticity in emerging countries. Late diagnosis and lack of treatment directly impact Gross Motor Function Classification System (GMFCS) grade [10].

Surgery, and notably multi-site surgery, is possible, if backed up by rehabilitation, which is the prerequisite for improvement [11]: surgery alone is bound to fail.

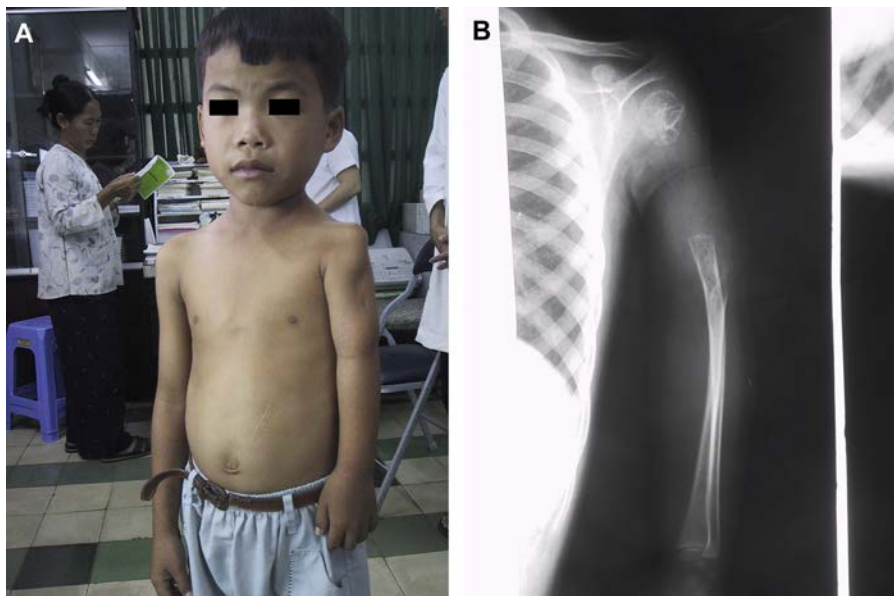
### 4.2.5. Congenital dislocation of the hip

Congenital dislocation of the hip may be encountered in older children. Conservative treatment is not feasible on a short mission: surgical reduction should be associated to pelvic osteotomy and femoral shortening. The local team in charge of follow-up and changing the cast needs to be competent.

## 4.3. Frequency

Certain pathologies have become exceptional in Europe thanks to antenatal diagnosis, but are still frequent in emerging countries. This is the case for myelomeningocele and arthrogryposis.

Treatment of arthrogryposis is difficult without physiotherapy. Assessment of severity and functional prognosis is essential to guiding surgical strategy. The objective is, if possible, to enable the child to stand, correcting mainly deformities of the feet and knees.



**Fig. 6.** Sequela of osteomyelitis with bone defect and growth disorder. A. Clinical aspect. B. Radiographic aspect.



**Fig. 7.** Operating room, Paul VI Hospital, Ouagadougou.

Other conditions are also frequently encountered, being a focus for humanitarian aid: club hand, Apert syndrome, proteus syndrome, etc.

## 5. Do working conditions differ?

Working conditions are not those we are used to, and vary from mission to mission. They need to be assessed at the outset, so as to adapt the mission accordingly. The rule is to avoid scheduling a difficult case on day 1, so as to allow for assessment, nor during the final days, so as to be able to ensure immediate follow-up.

### 5.1. Material conditions

#### 5.1.1. Operating room

The operating room may be rudimentary (Fig. 7), with deficient asepsis (a fan instead of air conditioning, etc.) and no fluoroscopy available. On the other hand, the infrastructure sometimes perfectly meets European standards.

#### 5.1.2. Instruments and implants

Instruments are often poor quality and unsuited to “fine” surgery. In some missions, notably those dedicated to hand surgery, it is recommended to come with a basic instrument set (forceps, scissors) and lenses.

There may not always be a power drill or saw, in which case osteotomy uses an osteotome or Gigli saw, which the local surgeons handle expertly.

Osteosynthesis material may be no more than K-wires and an unmatched assortment of plates and screws. It is very useful to bring Blount staples, which allow easy fusion of osteotomy (systematically associated to plaster cast immobilization).

Plaster quality may not meet expectations, making it difficult to use, especially as drying time is longer in countries with high humidity.

### 5.2. Prostheses

Prostheses can often easily be produced locally when necessary. They may not meet European standards, but are effective, functional and inexpensive. One should always be ready to trust the ingenuity of the local team (Fig. 8).

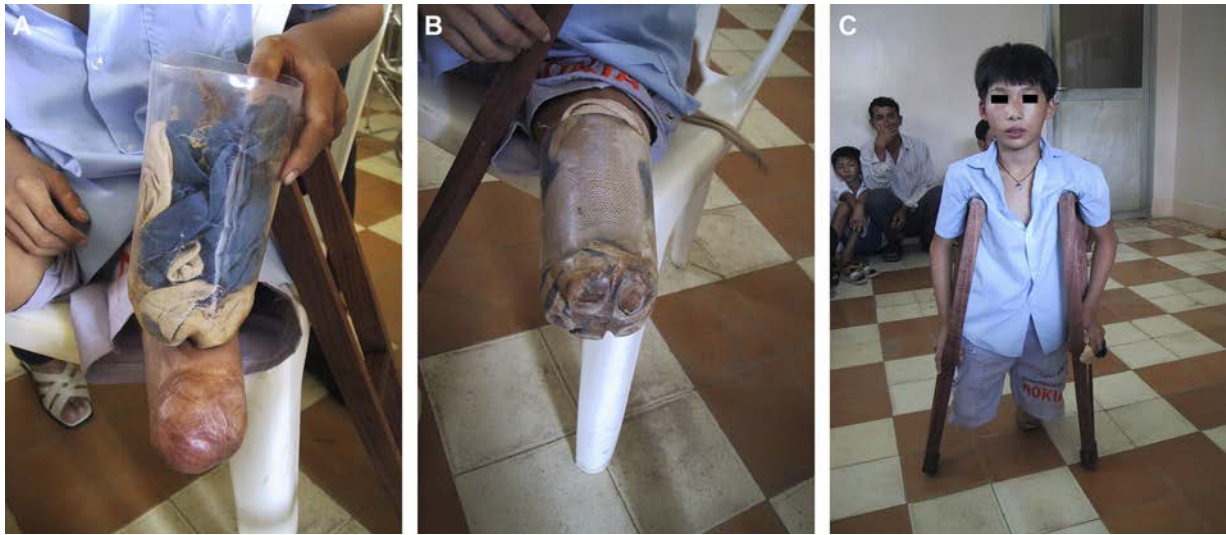
### 5.3. Paramedical staff

The paramedical staff is usually very willing, but training varies and competence has to be checked. We have often had very competent nurses: in Myanmar, most had had 1 year’s training in France. In other cases, training was deficient, even at the level of basic asepsis.

These factors need bearing in mind for postoperative surveillance, which is ensured by the nursing staff alone. It is essential to make a daily ward round before leaving the hospital at the end of the day; in case of doubt or in difficult cases, it may be necessary to check again during the evening.

### 5.4. Outpatient clinic conditions

The outpatient clinic is one of the most difficult moments of the mission. It is held on the day of arrival, after a tiring journey.



**Fig. 8.** Locally made low-cost and reasonably functional prosthesis.



**Fig. 9.** What a consultation may look like.

Privacy is often lacking, and one needs to keep calm in all the noise and carry on (Fig. 9).

There are always many patients to look after: some hundred children to be seen in a day. There is thus very little time to devote to each one. Interviewing is brief, hampered by the language barrier. This is true in South-East Asia, but equally in French-speaking Africa, where only the local dialect may in fact be spoken. Complementary examinations are few and far between: at best, X-ray (the date of which should be checked).

The outpatient clinic allows triage of patients not needing surgery, those who can be operated on and those who cannot, due to the severity of the pathology, lack of material conditions, impossibility of postoperative physiotherapy, etc.

### 5.5. Surgery

In the operating room, the atmosphere is relatively calm. But what seems obvious in our theaters may not be so straightforward on a humanitarian mission. At the beginning, patients therefore

need surveillance at all times; one has to check that it is the right patient, check positioning and tourniquet, etc. Checks have to be made each step of the way, up to producing the plaster cast. Later, as one gets to know the team, certain tasks can be progressively delegated, although one needs to remain in control of the situation.

### 5.6. Anesthesia

Certain missions require pairwork between a surgeon and an anesthetist. This is the case for scoliosis surgery, for which the local anesthesiology team has to be trained.

### 5.7. Postoperative follow-up

After departure, it is the local team that ensures follow-up. Instructions need to be clear, especially as regards immobilization time, K-wire removal schedule and orthosis fitting. Ideally, patients should be called in and followed up on a subsequent mission.



## 6. Examples of humanitarian missions

As we have stressed, each mission is different, and all are useful. We shall take three examples that are representative of what an effective humanitarian pediatric orthopedic surgery mission can be.

### 6.1. Orthopedic mission in Vietnam

This program is now 20 years old; the first missions were set up in 1996 by Dr Yves Desgrappes and the *Chaîne de l'Espoir*, and have been continued by *Children Action*.

Every year, six 10-day missions are made by a group of surgeons, members of the SoFOP. Patient recruitment is assured by the local teams, sometimes via an advertisement in the press. The program has so far mainly targeted a few hospitals. Since 1996, about 50,000 consultations and 4500 surgical procedures have been performed.

A detailed description was given in several articles published in No. 34 of the SoFOP Gazette [12], available on-line.

Here, we shall highlight some of the strong points of these missions' success:

- a humanitarian organization (*Children Action*), with a clear program and objectives, deals with logistics and relations with the local health authorities;
- a group of trained and experienced surgeons, who know each other well, are agreed on indications and treatment;
- there is a partnership with the local teams who ensure follow-up;
- there is a local coordinator, who is an essential part of the mission: she is the relay with the local authorities and teams, takes part in drawing up the mission program, ensures logistics, notably regarding instruments and implants, acts as interpreter for the families, updates patient records, etc.;
- patient files (Fig. 10): a dedicated file is held for each patient seen in consultation, comprising: the initial examination form, surgical report, postoperative instructions, and follow-up forms filled out by each member of the mission. These standardized forms ensure long-term patient management and assessment of results. The follow-up rate is more than 60%.

### 6.2. Scoliosis program in Myanmar

This project was launched by Pr Alain Patel, president of the *Association Médicale Franco-Asiatique* (AMFA) that has been operating in Asia for more than 30 years, in response to a request from Pr Kyaw Myint Naing (President of the Myanmar Medical Association). The aim is to train Burmese surgeons in scoliosis procedures. The initial assessment mission in the Yangon (Rangoon) Orthopedic Hospital was made in 2005, with 5 patients operated on (Fig. 11). All went well, and the project continued, with two and later four missions per year. From the outset, the same two teams, comprising surgeon and anesthetist, have alternated. Patients are examined, discussed and operated on with Burmese surgeons, some of whom are spine specialists. Time is reserved for teaching, in agreement with the University. We now know the local team very well, along with the material conditions and the capacities of each one. Immediate follow-up is ensured by the Burmese surgeons, with the possibility of keeping us informed via the Internet. At each new mission, most of the patients who had been operated on are seen again. After 10 years, more than 200 patients have now been treated.

For two years now, *Children Action* has taken over the project and extended it to Mandalay (with the second largest university of Myanmar) as requested by the Burmese surgeons. Training missions in general pediatric orthopedics have also been started in children's hospitals.

### 6.3. Dedicated mission: clubfoot treatment by the Ponseti method

Treatment of clubfoot is a humanitarian challenge in pediatric orthopedics. Worldwide, 150,000 to 200,000 children are born with clubfoot every year, 80% of them in emerging countries [13].

The Ponseti method has become the gold standard for management of clubfoot. It is inexpensive, and easy to implement when means are scarce.

Several organizations have therefore dedicated missions to this treatment, including *Walk for Life* and *Ponseti International*, which have recently published results.

In the *Walk for Life* project in Bangladesh [14], 8000 children have been treated for clubfoot, in 43 clinical sites throughout the country. The objectives are to treat the children and train the local teams. Results were analyzed in children treated before 3 years of age, without previous treatment history. The first 400 cases showed 99% good results, with recovery of independent plantigrade gait. Without the project, 60% of the children would not have received treatment.

*Ponseti International* analyzed the results of its missions in 10 countries in Asia, Africa and South America [13]. In a total of 110 clinical sites, 634 practitioners were trained: surgeons and physicians, but also physiotherapists and prosthetists. A total of 7705 children were treated. The article shows that a joint effort with a nationwide program for clubfoot treatment was a success. Factors for success comprised: teamwork between the NGO and its local partners, notably including the Health Ministry, coordinated organization, with the local team, standardized teaching, and financial support.

Factors for failure comprised: local lack of interest and professional rivalry, difficulties of patient transport, lack of financial support, and lack of information.

### 6.4. Programs operating on children in Europe

Beside humanitarian missions abroad, some NGOs finance operations in Europe for heavy pathologies that cannot be managed locally. These may be NGOs with large means at their disposal (*Chaîne de l'Espoir*, *Médecins du Monde*, etc.) or not (*Papaye Verte*, *Réponse* in Senegal, etc.). These programs also deserve support.

## 7. Teaching in humanitarian missions

### 7.1. Teaching should be an integral part of humanitarian missions

Teaching may be academic or individualized, addressed to different audiences: students, nurses or surgeons.

It enables local teams to progress, and is certainly the most striking feature left after the end of a mission. It would be a big mistake to manage children without giving any explanations to the local teams: this is the danger of a mission that moves on taking the entire team (surgeon, nurse, anesthetist) with it; some children will indeed have been operated on, but with what outcome?

### 7.2. Teaching should be adapted

Teaching should be adapted to local needs and conditions and to the economic situation of the country.

### 7.3. The local university should be a partner

This is primordial. Teaching should be organized with the university and university teachers, otherwise the local team will





Fig. 10. Patient records, indispensable to follow-up and mission assessment.

be isolated from its medical community. So far as possible, an agreement should be drawn up with the university or its representatives at the start of the mission; afterward, it will be too late.

#### 7.4. Times have changed

Many surgeons from emerging countries have been able to have periods abroad in which to train and learn surgical techniques and indications.

Internet has changed the state of play. Missions used to bring Western help and know-how to surgeons who rarely had access to this themselves. With the Internet, surgeons in all countries have direct access to knowledge and know-how. This highlights the usefulness of Web-based teaching (e-learning).

## 8. Recommendations and rules for a humanitarian mission

### 8.1. Preparing the mission

Before setting off, one needs to learn about the country of destination, its customs, culture and history. One also needs to know about the pathologies likely to be encountered and the equipment that is going to be available. Depending on the mission, one may take some basic instruments with one. For osteosynthesis, staples and K-wires are of great help. Specific instrumentation may be needed for certain missions. Industry can provide precious support, which one should not hesitate to ask for.

### 8.2. Realistic objectives

The prime objective is to provide benefit for the patients. One should not overreach oneself and sacrifice quality to quantity.



**Fig. 11.** 14-year-old girl with scoliosis and spinal dysraphism. One of the first cases operated on in Myanmar. A and B. Preoperative. C and D. Postoperative.

Turnover is not the point. The mistake that beginners make is to want to carry out all possible procedures during the mission, even if there is not really time, indications are borderline and postoperative care cannot be ensured.

It is more reasonable to give more time to certain patients and to schedule others for a following mission or else leave the simpler cases to the local team.

### 8.3. Adapting indications

Indications and strategy may differ. Indications have to take account of the local environment, the quality of the operating room, subsequent follow-up, possibilities for rehabilitation, etc.

Thus, management may be different on a humanitarian mission than it would have been in Europe.

Examples are numerous. In kyphoscoliosis or Pott's kyphosis, in situ grafting is preferable, whereas in France one would more likely suggest vertebral column resection or osteotomy.

In clubfoot, the Ponseti method is used regularly. However, surgical treatment may be preferable for patients who live far away

and do not have easy access to a center where the method is performed.

### 8.4. Saying "no"

Sometimes, you have to say "no" – quite often, in fact. We have to restrict ourselves to surgical indications that are sure and where the result is going to be beneficial. Risky indications are to be avoided. Surgical acrobatics is out of the question (Fig. 12). There is a great temptation to operate on everything, as if it were that or else nothing for the patient. It is better to leave the patient in a moderately acceptable but familiar and adapted condition rather than operate and leave the patient facing an uncertain postoperative future (Fig. 13).

For example, one should not risk trying to operate on a scoliosis in a myopathic patient who is not going to receive any postoperative respiratory care. Likewise, one may have to turn down a case of cerebral palsy when there is no chance of having postoperative physiotherapy.



**Fig. 12.** Being able to say “No” for a patient with severe neuromuscular scoliosis in which postoperative risk would be high.

In the SoFOP Gazette [12], Kaelin listed 4 situations we are liable to encounter:

- pathology requiring simple procedures that do not need special means, and with low risk of failure: resection of hexadactyly, tendon surgery, simple osteotomy, fusion for irreducible clubfoot, etc.;
- pathologies involving a risk of failure, due to the difficulty of the procedure or the need for secondary care: surgical reduction of congenital hip dislocation, progressive axis correction by external fixator, surgery program in a spastic diplegic or quadriplegic patient, etc. One has to be sure that the local team is able to provide adequate follow-up;
- programmed surgery for complex deformity. Certain pathologies may be grouped together for a dedicated mission: e.g., complex hand deformities. In scoliosis, patients can be prepared by the

local team, with halo traction for 1 month before the mission. Another mission might be dedicated to external fixation in complex limb deformity;

- treatment is not feasible: such is the case, for example, for myopathy, neurologic disease or severe arthrogyposis.

We feel that there is a 5th situation to be added here: high risk of failure, but where treatment is mandatory. The issue is the choice of surgical indication. The classical example would be congenital pseudarthrosis of the tibia, where the risk of failure and iterative surgery is notorious (Fig. 14). Should one propose a program of reconstruction, or amputation?

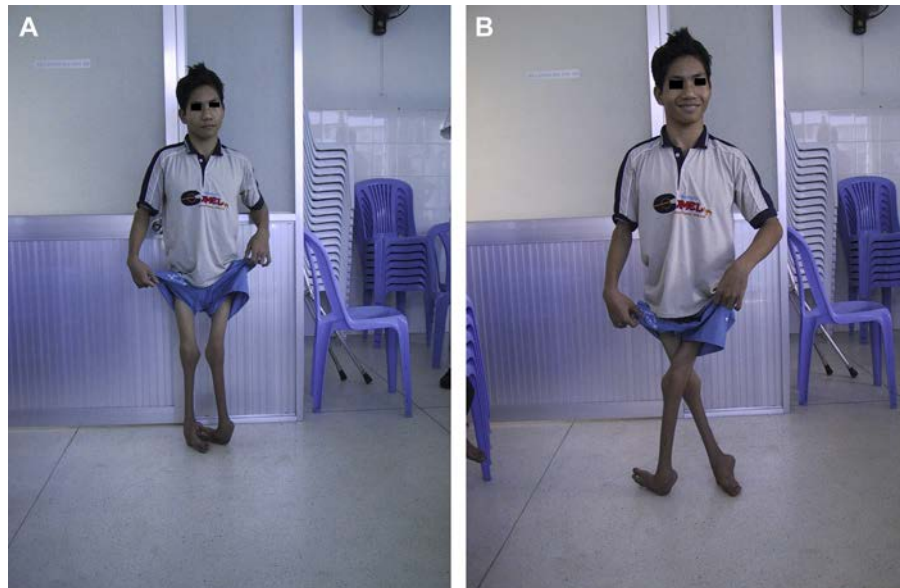
We treated 6 such cases in Myanmar, using the induced membrane technique. But this required two missions at a short interval: one for resection and cementing, and the second for bone grafting, with regular follow-up afterward. For the moment, results are only moderate, with satisfactory consolidation in half the cases, but with length discrepancy that will have to be treated later. Might it not have been preferable to suggest amputation? For us, the question is open.

### 8.5. Being able to cooperate

During the mission, our behavior toward the patients and the local teams has to be exemplary. We have a lot to offer, but also receive a lot in return and can often learn from the local surgeons, especially in conditions such as tuberculosis. Indications for surgery have to be discussed with each patient individually: one should never impose one’s point of view by force, and above all never cause the local surgeon to lose face, especially in front of the students and nurses. Changes should be suggested diplomatically: we are there for a short while, and after we have left life will go on.

### 8.6. Knowing what you are getting into

It should not be thought that the NGO is always welcome in the country’s medical structure: the mission may find itself in competition with local structures, even if the aim is to care for indigent patients who would not otherwise have had access to treatment. Also, in some areas, traditional medicine may be highly developed



**Fig. 13.** A and B. Being able to say “No” for a patient who is reasonably independent and able to walk unassisted despite severe deformity.



**Fig. 14.** A and B. Congenital pseudarthrosis. A complex situation in a humanitarian mission: what is the most suitable therapeutic indication?

and very useful. We must not destabilize the whole situation in a single mission.

For some years now, a humanitarian competition has been going on between NGOs, with negative effects impairing the efficacy of missions in general. It is essential for NGOs to get on well together and be complementary rather than in competition.

#### 8.7. Being vigilant

The world being what it is, financial considerations are sadly the same everywhere. Some unscrupulous local partners may turn a mission to their own financial advantage, claiming a special relationship with the NGO in question. Unbeknowingly, one may be drawn into corrupt private surgery scams and queue-jumping.

#### 8.8. Assessing results

Apart from the immediate feeling of satisfaction that comes with the end of a mission, we need to assess results over the long-term, following patients up on subsequent missions. This is the great advantage of having individual patient record forms, enabling objective analysis of results. Assessment is essential in order to improve efficacy and above all to know whether our missions have been useful.

### 9. Conclusion

This presentation sought to give some pointers for running a humanitarian mission, or rather a mission of cooperation, in emerging countries. However, there are no strict rules, and contexts are always different; one of the qualities needed on a mission is to be able to adapt, which is a prerequisite for success.

The take-home message is that this surgery requires experience: it is a good idea to be accompanied at first by a colleague who is used to humanitarian missions.

On a mission, we give, but also receive a lot: from the local teams, and from the patients themselves. These are often lessons in life.

Finally, we physicians are just one link in the humanitarian chain. Our missions are only possible thanks to the off-stage work of the NGO's volunteers and the generosity of donors – to all of whom, our thanks.

#### Disclosure of interest

The authors declare that they have no competing interest.

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