Humanitarian Surgical Care Provided by a French Forward Surgical Team: Ten Years of Providing Medical Support to the Population of the Ivory Coast

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ABSTRACT Introduction: The aims of this study were as follows: first to quantify and review the types of surgical procedures performed by military surgeons assigned to a Forward Surgical Team (FST) providing medical support to the population (MSP) in the Ivory Coast (IC), and second to analyze how this MSP was achieved. Methods: Between 2002 and 2012, all of the local nationals operated on by the different FSTs deployed in the IC were included in the study. The surgical activity was analyzed and divided into surgical specialties, war wounds, nonwar emergency trauma, nontrauma emergencies, and elective surgery. Demographics, circumstances of health care management, wounded organs, and types of surgical procedures were described. Results: Over this period, surgeons operated on 2,315 patients and performed 2,556 procedures. Elective surgery accounted for 78.7% of the surgical activity, nontrauma emergencies accounted for 12.7%, nonwar emergency trauma accounted for 8%, and war wounds accounted for 0.6%. The main surgical activities were visceral (43.8%) and orthopedic (including soft tissues) surgeries (38.5%). Conclusion: The FSTs contributed widely to MSP in the IC. This MSP required limited resources, standardization of the procedures and specific skills beyond the original surgical specialties of military surgeons to fulfill the needs of the local population.

INTRODUCTION

In September 2002, responding to an attempted coup in Abidjan, Ivorian legal authorities required the implementation of the Ivorian–French Defense Agreements and U.N. Resolution 1528. Despite a reconciliation government initiative agreed on in France (the Linas-Marcoussis agreement of 2003), a fierce civil war ensued. The 2011 presidential election was the starting point of progressive normalization of the political situation in the country, allowing for a decrease in the French military presence.

Despite the evolution in the French–Ivorian cooperation agreement into a defense partnership, the missions of the Force Licorne remained unchanged: to train and reinforce the Ivorian Army and to protect French nationals in the Ivory Coast (IC).[1] French Forward Surgical Teams (FSTs) were deployed from the beginning of Operation Licorne to provide medical and surgical support to the troops. In addition to the medical support provided to the military forces in agreement with French military medical doctrine,[2] these FSTs also provided medical support to the population (MSP). Other countries have also proposed humanitarian aid, most often over

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short periods of time, such as the humanitarian civic assistance mission to the Americas[3] or humanitarian aid to local nationals in Afghanistan.[4] The French Army has a long tradition of military and political presence in Francophone Africa. The actions of the French Medical Health Service, resulting from this tradition that dates from colonial times, are unique, and the French Army remains the only force to provide sustainable MSP in Francophone Africa (in Operation Épervier in Chad, for example[5,6]).

The first aim of this study was to quantify and review the types of surgical procedures performed by military surgeons assigned to FSTs providing MSP, according to encountered surgical pathologies, logistic capacities and capabilities. The second aim of this study was to analyze how MSP was achieved to translate past lessons learned into teaching tools to improve the manner in which we deliver MSP in isolated situations in Africa.

PATIENTS AND METHODS

Study Design

Between September 2002 and August 2012, 2,559 patients were treated by a French FST (NATO role 2) deployed in the IC for surgical care. All operation reports of all FSTs were entered from the battlefield into the French Opex Datasystem (File Maker Pro 2008; File Maker, Santa Clara, California). All of the operating theater records from this study period were transferred to a prospectively maintained database and were retrospectively analyzed. Among the 2,559 patients prospectively recorded, 244 were French military personnel (9.5%) and 2,315 were local Ivorian nationals (90.5%), all of whom were eligible for this study and enrolled in a multicentric observational study.

French FSTs

French FSTs were deployed discontinuously at six different sites (Abidjan, Bouaké, Kokumbo, Korghogo, Toumbokro, and Yamoussoukro) (Fig. 1), but with a minimum of 2 FSTs deployed at the same time until 2009 and only one since 2009 in Abidjan. The Yamoussoukro FST was equipped with a computed tomography scanner. Over this period, all of the surgical procedures were performed by a team of 12 people (replaced every 3–4 months): an anesthetist, a general surgeon (specializing in digestive surgery, urological surgery, or thoracic and vascular surgery), an orthopedic surgeon, 2 anesthetist nurses, a scrub nurse, 2 ward nurses, 3 assistant nurses, and an administrative noncommissioned officer.[7] Each FST had one operation room with fluoroscopy, an intensive care unit and material for bacteriological analysis. However, no basic pathological examinations were available, osteosynthesis was limited to external fixation or internal fixation with K-wires or plates, rehabilitation was not possible, and plain radiography was the only imaging modality available, except during the short period when a CT scanner was present in

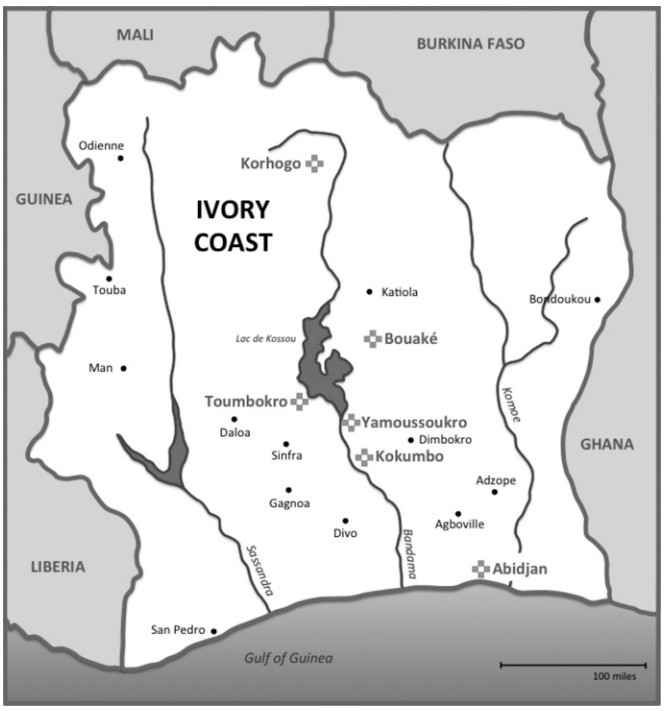

FIGURE 1. Location of the deployment of 6 FSTs in the Ivory Coast.

Yamoussoukro. Mesh was not available for routine use, and its use depended on the amount that each surgeon brought during each mission. The number of available beds for MSP in wards was also a limiting factor because it rarely exceeded six beds per day. Operated patients are only discharged when the postoperative course remains simple regardless of the length of stay. The routine postoperative care of the wound is realized in daily outpatient clinics run by military nurses with supervision of the surgeons. When a reoperation is required, it is realized within the FST. The operated patients are not systematically reviewed in postop clinics but when postoperative surgical reviews are necessary, patients get outpatient appointment as often as required.

Variables and Data Sources

The patients were divided into 4 categories: war (battle) wounds (WWs), nonwar (battle) emergency trauma (NWET), nontrauma emergencies (NTEs), and elective surgery (ES). Patients with WWs, NWET, and NTEs were presented directly at the FST. Elective surgery was provided to the local population in accordance with the French military doctrine of MSP.[2]

The patient demographics collected included age, with the patients divided into groups of adults and children (younger than 16 years old), sex, circumstances of wounds, encountered pathologies, and the types and number of operations performed. The breakdown of patients was determined by surgical specialty. We calculated the ratio, defined as the number of patients requiring surgery divided by the number of operative procedures performed, as a valuable marker of clinical effectiveness of MSP. Indeed, MSP must not impair the

capacity of the FST to support the French military Forces deployed. Ideally short surgical procedures, efficient and low-consuming equipment are intentionally selected. Therefore, a ratio close to one meets these requirements. A lower ratio shifts us away from the principles of good practice of MSP.

RESULTS

Patient Demographics and Circumstances

The patients' demographics and circumstances are summarized in Table I. Briefly, among the 2,315 patients included in this study, 1,237 (53.4%) were male, 622 (26.9%) were female, and 456 were (19.7%) children. ES was performed for 1,821 patients (78.7%), NTEs were treated in 294 patients (12.7%), NWET were treated in 185 patients (8%), and WWs were treated in 15 patients (0.6%). The ratio for ES was close to 1 (0.93), and as the seriousness of the circumstances of care increased, the ratio decreased to 0.84 for NTEs, 0.79 for NWETs, and 0.50 for WWs.

Global Surgical Activity

Between September 2002 and August 2012, 2,315 patients were operated on in the different FSTs deployed in the IC, and these patients required 2,566 surgical procedures. The breakdown of procedures by surgical specialty is summarized in Table I.

Briefly, the main proportion of surgical activity consisted of visceral and orthopedic (including soft tissues) surgeries (82.3%). General surgeons performed all of the surgical procedures for visceral surgery (43.8%), gynecology (9.3%), urology (5.6%), thoracic (0.2%), and vascular surgery (0.1%). Orthopedic surgeons performed all of the orthopedic and soft-tissue cases (38.5%). Head and neck cases (2.5%) were equally treated by a general or orthopedic surgeon.

Breakdown of Surgical Activity by Specialty

Visceral Surgery

ES represented the main activity, with 89.2% of all the digestive procedures, and among these surgeries, abdominal wall surgery accounted for 76.3% of all the visceral procedures (Table II). Briefly, 703 unilateral hernias (including 17 recurrent hernias) were repaired (83.7% of patients), 48 bilateral hernias (including 2 recurrent hernias) were repaired (5.7%), 28 cases of persistent patency of the processus vaginalis in children were closed (3.3%), and 56 umbilical and/or midline hernias (6.7%) and 5 incisional hernias (0.6%) were repaired. Herniorrhaphy, according to the Shouldice or Bassini technique, was the routine repair procedure chosen for 91.7% of the adult patients with inguinal hernias. Mesh was installed for all 19 recurrences and for the other 43 patients with large inguinal hernias (8.3% of all of the cases). 112 patients presented with thyroid disease, including 88 patients with endemic nontoxic goiter, leading to 60 subtotal thyroidectomies and 28 isthmolobectomies; furthermore, 24 patients

TABLE I. Summary of all of the Surgical Activity Performed Between September 2002 and August 2012, Based on the Sex of the Ivorian person, Circumstances of Support and Different Surgical Specialties

	Genre						Circumstances									
	Male		Female		Children		WW		NWET		NTE		ES		Total	
	No. of Patients	No. of Surgical Procedures	No. of Patients	No. of Surgical Procedures	No. of Patients	No. of Surgical Procedures	No. of Patients	No. of Surgical Procedures	No. of Patients	No. of Surgical Procedures	No. of Patients	No. of Surgical Procedures	No. of Patients	No. of Surgical Procedures	No. of Patients	No. of Surgical Procedures
Visceral	744	765	207	212	145	148	2	3	3	3	110	116	981	1,003	1,096	1,125
Orthopedic	355	429	165	194	260	365	13	27	171	219	120	168	476	574	780	988
Gynecologic	0	0	233	236	2	2	0	0	0	0	31	31	204	207	235	238
Urology	104	113	2	2	28	28	0	0	0	0	10	11	124	132	134	143
Head and Neck	29	31	14	14	19	19	0	0	9	9	17	19	36	36	62	64
Thoracic	4	4	1	1	1	1	0	0	2	2	4	4	0	0	6	6
Vascular	1	1	0	0	1	1	0	0	0	0	2	2	0	0	2	2
Total	1,237	1,343	622	659	456	564	15	30	185	233	294	351	1,821	1,952	2,315	2,566
Ratio	0.92		0.94		0.81		0.50		0.79		0.84		0.93		0.90	

TABLE II. Details of the Activity of Visceral Surgery Based on Pathology and Circumstances of Support

	Patients (*n*)	Surgical Procedures (*n*)	Ratio
Elective Surgery	981 (89.5%)	1,003 (89.2%)	0.98
Abdominal Wall Hernia	840	859	0.98
Inguinal herniorrhaphy	689	706	0.98
Closure of Persistent Patency of the Processus Vaginalis	28	28	1.00
Inguinal Hernioplasty	62	63	0,98
Midline Herniorrhaphy	56	56	1.00
Midline Hernioplasty	5	6	0.83
Thyroid Removal for Goiter	112	114	0.98
Subtotal Thyroidectomy	81	82	0.99
Isthmo-lobectomy	31	32	0,97
Cholecystectomy for Symptomatic Gallstones	9	9	1.00
Digestive Resection for Symptomatic Tumor	13	13	1.00
Right Colectomy	5	5	1.00
Left Colectomy	8	8	1.00
Enterostomy Closure	7	8	0.88
Non-trauma Emergency	110 (10%)	116 (10.3%)	0.95
Incarcerated Hernia	18	19	0.95
Inguinal Herniorrhaphy	14	15	0.93
Inguinal Herniorrhaphy + Abdominal Small Intestine resection	4	4	1.00
Perforated Gastroduodenal Peptic ulcer	8	8	1.00
Suture of Peptic Ulcer	4	4	1.00
Antrectomy, Vagotomy, and Roux-en-Y Diversion	4	4	1.00
Typhoid Peritonitis	22	25	0.88
Small Bowel Resection and Anastomosis	11	12	0.92
Limited Ileocecal Resection	9	11	0.82
Ileocolostomy	2	2	1.00
Acute Appendicitis	51	52	0.98
Mc Burney Appendectomy	40	41	0.98
Midline Laparotomy for Perforated Appendicitis Peritonitis	11	11	1.00
Sigmoid Volvulus	7	7	1.00
Hartmann's Procedure	4	4	1.00
Sigmoidectomy + Anastomosis	3	3	1.00
Proctology	4	5	0.80
Incision of Anal Abscess	1	2	0.50
Anal Fistulae Drainage	3	3	1.00
Non-war Emergency Trauma	3 (0.3%)	3 (0.3%)	1.00
Abdominal Stab Wound	3	3	1.00
War Wounds	2 (0.2%)	3 (0.3%)	0.67
Abdominal Gunshot Wound	2	3	0.67

with toxic goiter underwent 21 subtotal thyroidectomies and 3 isthmolobectomies. NTEs represented 10.3% of the visceral surgical procedures, 77.6% of which were for visceral infections: 52 surgical procedures were performed for appendectomies, 33 for peritonitis (8 for perforated duodenal peptic ulcers, 25 for typhoid peritonitis with small bowel perforation), 2 for perianal abscesses, and 3 for anal fistulae. The cases of NWET consisted of 3 abdominal stab wounds requiring atypical hepatectomy with gastric sutures, 1 right colectomy, and an explorative laparotomy without visceral lesions. The WWs consisted of 2 abdominal gunshot wounds with sigmoid perforation, requiring Hartmann's procedure for one and small bowel resection and anastomosis for the other.

Orthopedic Surgery

The distribution between planned surgery and emergency surgery was similar, constituting 51% and 49% of activities, respectively (Table III).

Regarding nonurgent pathologies, infectious diseases and tumor excision (mainly considered benign) represented the most frequent surgeries, constituting 40.8% and 25.4% of cases, respectively. Buruli ulcer was the most important infectious disease (141 patients), with most of the patients receiving conservative treatment (94%). Cases of extremity trauma sequelae (89 patients) were dominated by septic or nonseptic nonunions (46 patients), malunions (13 patients), and burn sequelae (12 patients). Clubfoot talipes equinovarus (22 patients) and polydactily (7 patients) represented the congenital malformations. The patient/surgical procedure ratio of congenital diseases (0.66) was the lowest, followed by trauma sequelae (0.76), infectious diseases (0.78), and tumors (0.98).

Regarding emergencies, the WW (13 patients) number was very low compared with NWET (171 patients) and infectious emergencies (120 patients). Among the 42 fractures, 27 were stabilized by internal fixation (29 interventions), 10 by external

TABLE III. Details of the Activity of Orthopedic Surgery Based on Pathology and Circumstances of Support

	Patients (*n*)	Surgical Procedures (*n*)	Ratio
Elective Surgery	476 (61%)	574 (58.1%)	0.83
Infectious Disease	183	234	0.78
Sequestrectomy for Osteomyelitis	38	43	0.88
Conservative Treatment for Buruli Ulcer	133	179	0.74
Amputation for Buruli Ulcer	8	8	1.00
Excision of Limb Tumor (Considered as Benign or Malignant)	143	146	0.98
Trauma Sequelae	89	117	0.76
Bone Grafting and Fixation for Nonunion	46	63	0.73
Osteotomy and Internal Fixation for Malunion	13	15	0.87
Z-plasty and Skin Grafting for Burn Sequelae	12	17	0.71
Neurolysis for Peripheral Nerve Entrapment	11	11	1.00
Arthrolysis for Joint Stiffness	4	8	0.50
Temporary Fixation for Joint Instability	3	3	1.00
Treatment of Congenital Malformations	29	44	0.66
Hardware Removal	27	28	0.96
Arthrodesis for Degenerative Pathology	5	5	1.00
Non-trauma Emergency	120 (15.4%)	168 (17%)	0.71
Incision of Soft-tissue Abscess (Hand Excluded)	81	122	0.66
Treatment of Hand Infection	22	26	0.85
Joint Irrigation for Arthritis	10	12	0.83
Necrosectomy	7	8	0.88
Non-war Emergency Trauma	171 (21.9%)	219 (22.2%)	0.78
Debridement of Soft-tissue Wound	108	124	0.87
Treatment of Fracture (Fixation or Plaster)	42	55	0.76
Reduction of Dislocation	9	11	0.82
Debridement of Burn Wound	9	26	0.35
Removal of Foreign Body	3	3	1.00
War Wounds	13 (1.7%)	27 (2.7%)	0.48
Debridement of Soft-tissue Wound	9	9	1.00
Debridement, External Fixation, and Flap Coverage for Gunshot Wound Involving Bone	4	18	0.22

fixators (20 interventions), and 5 by plaster (6 interventions). Of the 9 dislocations, all were reduced under general anesthesia, but 3 required reintervention (1 elbow and 2 hips) for early dislocation relapses.

Gynecologic Surgery

The details of the gynecologic surgical procedures are summarized in Table IV. Briefly, 204 patients (86.8%) were operated on electively. Elective hysterectomies (total and subtotal

TABLE IV. Details of the Activity of Gynecologic Surgery Based on Pathology and Circumstances of Support

	Patients (*n*)	Surgical Procedures (*n*)	Ratio
Elective Surgery	204 (86.8%)	207 (87%)	0.99
Symptomatic Uterine Fibroid	146	148	0.99
Total Abdominal Hysterectomy With Conservation of Ovaries	55	56	0.98
Total Abdominal Hysterectomy Without Conservation of Ovaries	15	16	0.94
Supracervical Abdominal Hysterectomy With Conservation of Ovaries	54	54	1.00
Supracervical Abdominal Hysterectomy Without Conservation of Ovaries	15	15	1.00
Uterine Myomectomy	7	7	1.00
Symptomatic Ovarian Cysts	38	38	1.00
Unilateral Salpingo-oophorectomy	27	27	1.00
Bilateral Salpingo-oophorectomy	5	5	1.00
Ovarian Cystectomy	6	6	1.00
Breast Tumor	16	17	0.94
Breast Tumorectomy	11	11	1.00
Cleanliness Mastectomy	5	6	0.83
Promontofixation for Prolapse	4	4	1.00
Non-trauma Emergency	31 (13.2%)	31 (13%)	1.00
Cesarean Section	15	15	1.00
Salpingectomy for Salpingitis	11	11	1.00
Incision of Infected Breast Tumor	5	5	1.00

TABLE V. Details of the Activity of Urological Surgery Based on Pathology and Circumstances of Support

	Patients (*n*)	Surgical Procedures (*n*)	Ratio
Elective Surgery	124 (92.5%)	132 (92.3%)	0.94
Hydrocele Testis	89	97	0.92
Partial Resection of the Hydrocele Sac	86	92	0.93
Plication of the Hydrocele Sac	3	5	0.60
Cryptorchidism Treatment	2	2	1.00
Orchiectomy	10	10	1.00
Epididymal Cyst	9	9	1.00
Symptomatic Varicocele	4	4	1.00
Removal of Bladder Stones by Laparotomy	3	3	1.00
Posthectomy	5	5	1.00
Ureteral Reimplantation With Psoas Bladder	2	2	1.00
Non-trauma Emergency	10 (7.5%)	11 (7.7%)	0.91
Orchidopexy	3	3	1.00
Incision of Scrotal Abscess	7	8	0.88

with or without adnexal preservation) were by far the most frequent operations, with 148 surgical procedures for symptomatic myomas. Adnexal pathology represented 20.5% of the cases. There were 38 adnexectomies for ovarian cysts or hydrosalpinges and 11 adnexectomies for salpingitis or torsion. Breast pathology consisted of 5 total mastectomies, 11 lumpectomies for tumors, and 5 drainages of abscesses.

Urology

Surgery on the external genitalia of male patients was the most frequent urological surgery, and scrotal surgery accounted for the majority of interventions (Table V). Hydrocele testis treatment resulted in the performance of 92 surgical procedures for partial resection of the hydrocele sac and 5 for plication of the hydrocele sac. There were also 2 treatments of cryptorchidism, 10 orchiectomies for testicular atrophy, and resection of 9 epididymal cysts; 4 patients underwent varicocelectomy by Ivanisevic's technique because of symptoms with exercise or because of infertility. The NTEs consisted of 3 orchiopexies for testicular torsion and 7 incisions of scrotal abscesses.

Miscellaneous

Oral maxillofacial cases represented 64 procedures (2.5%), including 17 abscesses drained and 36 excisions of tumors or cysts. There were 6 thoracic procedures: 2 posterolateral thoracotomies for thoracic stab wounds, 1 pericardial drainage for a tamponade, and 3 decortications for empyema. Two vascular procedures were performed: 1 arterial limb obstruction and 1 aortoiliac approach for an aortic dissection, which was responsible for bilateral inferior limb ischemia.

DISCUSSION

Quantitative Analysis of the Activity

Over this studied period of 10 years, 2,566 surgical procedures were performed for 2,315 local national patients. From 2002 to 2008, 3 FSTs were systematically deployed simultaneously in IC and performed 1,951 procedures (with an average of 93 procedures/FST/year). From 2009 to 2012, only 1 FST was deployed in IC (Abidjan) and realized 615 procedures (138 procedures in 2009, 127 in 2010, 161 in 2011, and 189 in 2012). Similar data were reported by an American FST in Afghanistan, with 65 surgical procedures over 7 months.[4] However, these figures should be interpreted with caution because the Ivorian conflict has expanded over time and space and has alternated between periods of acute crisis (without any possibility of MSP) and stable periods with a greater possibility for MSP. French FSTs were initially established in tactical areas, where health care resources were destroyed, and free access to a surgical facility was an opportunity. In recent years, the IC has significantly invested in health care structures, such as rural polyclinics, where the standards of care are higher, thus marginalizing local traditional medicine. However, global local medical health care provision has been limited. In a few major towns, teaching hospitals or private health care organizations are available, but both systems charge the patients for care. Therefore, only a limited proportion of the population can afford the costs,[8] explaining why, even in "peacetime," residents continue to benefit from FSTs. War-wounded patients only represented 0.6% of all local nationals operated on, in contrast to 44.8% of war-wounded Afghan civilians over a period of 18 months in the French lead role 3 in Kabul.[9] This low level of war casualties demonstrated that local nationals had no access to FSTs during periods of fighting. Compared to other countries, such as Afghanistan, women and children represented 46.6% of patients, reflecting that female patients (26.9%) accepted male health care providers and were confident in the FSTs.

Qualitative Analysis of the Activity by Specialty

The breakdown of procedures realized for the Ivorian people showed that a broad variety of pathologies were treated, covering many surgical specialties. All of the surgical emergencies for infection (soft tissue, bowel disease, gynecology, and orthopedic) were obviously beneficial.

In elective digestive surgery, hernia repairs (under local anesthesia and as outpatient surgery when possible) and thyroidectomies were extremely frequent, with good results despite few resources. There was no mesh among the FSTs' resources, so its use does not exceed 10% in our study,

corresponding to the mesh that some surgeons were able to bring with them. It is the policy of the French Medical Health Service not to provide mesh to FSTs because they lack the optimal hygienic conditions in their operating rooms. In cases of giant inguinoscrotal hernias and in the absence of mesh, as previously described,[10] herniorrhaphy, followed by leaving of the distal sac in the scrotum, was preferred to limit the occurrence of complications, such as seroma, hematoma, or scrotal skin trophic difficulties. We now favor subtotal thyroidectomies to ensure patient survival if replacement therapy is not available. Cancer case management was closely discussed because the vast majority of the patients did not have access to pathology or any further oncologic treatment because it was not available or too expensive. Only the symptomatic cancer cases, for which a predictable complete removal of the tumor was possible, were submitted to surgery. Therefore, colorectal cancer management was limited to occlusions.

In the MSP setting, the management of extremity pathologies depended on the available technical and human resources. Soft-tissue procedures were predominant in this cohort, considering the variable hygiene of the operating rooms and/or the lack of osteosynthesis methods available. Bone surgery must be limited in austere conditions. Fractures should be stabilized by plaster, skeletal traction, or an external fixator that has been properly sterilized.[11] Surgical management of closed fractures should be considered without exposure, by percutaneous pining or elastic nailing, only if strictly sterile conditions and fluoroscopy are available. This type of treatment is particularly suitable for the management of fractures in children. Conversely, management of open fractures and/or closed fractures of long bones in adults was particularly challenging: the former required serial surgical procedures and extended hospitalization, and the latter are best managed by sophisticated internal fixation means that were not available in or suitable for FSTs. The large number of procedures per patient emphasized the challenge of nonunion and malunion treatment. If soft-tissue coverage could be performed in deteriorating conditions, achieving bone reconstruction was much more complicated for several reasons: the difficulty of administering appropriate and prolonged antibiotic treatment, the unavailability of specific surgical materials, and the impossibility of closely monitoring patients during the postoperative period. Thus, we strongly believe that patients with infected fractures and septic nonunions must not be treated in the FST and must be referred to local higher echelon of care because of the high rate of repeated surgical procedures, the high rate of complications, and the extensive use of resources. Finally, the lack of physical therapy is another main issue that should limit bone and joint surgery.[6] Debridement of burn wounds remains a very time- and material-consuming activity that must also be referred to local higher echelon of care since the high rate of repeated surgical procedures finally impairs the ability of the FST, as evidenced by the low patient/surgical procedure ratio (0.35).

In gynecology, hysterectomies for symptomatic uterine fibroids responsible for pain and/or anemia, cystectomies and salpingo-oophorectomies for symptomatic ovarian cysts were beneficial. A subtotal hysterectomy is a valid alternative to total hysterectomy for a surgeon who is not a specialist in gynecology. It is quicker, it incurs fewer risks to the ureters, and it is particularly adapted to the surgical management of myomas. Similar to digestive pathologies, the management of cancer cases in gynecology was controversial and was strictly limited to mastectomies for infected breast cancers when surgery could improve the dressings and the quality of life, which was extended to breast lumpectomies for some patients. The urology activity was relatively low (5.6% of surgical procedures) and was directly related to the presence of a general surgeon specializing in urological surgery in the FST. Over this 10-year period, the general surgeons were mostly specialists in digestive surgery, so they focused their consultations according to their expertise. Thus, it was not surprising that surgery on the external genitalia of male patients accounted for the majority of interventions. At the same time, no prostatectomies were performed, whereas prostatic adenoma represented up to 50% of the reasons for hospitalization in a urology department in Abidjan. In thoracic surgery, only recent pleural effusions were treated, so lung resections for sequelae of infections were performed very occasionally, only when a thoracic surgeon was deployed.

Concept of MSP

These 10 years of MSP have had no equivalent in other nations, and this study was the first, to our knowledge, to report such a long period of time in Africa. MSP is not humanitarian aid as is seen in cases of natural disasters; rather, it resembles the humanitarian civic assistance proposed, for example, by the United State Navy Ship Comfort in Central and South America and Caribbean Basin (NATO role 3)[3] or the humanitarian surgical care offered by FSTs or Combat Support Hospitals in Afghanistan.[4,12] Defined by a specific doctrine,[2] MSP indicates all of the activities performed by the French Medical Health Service, in addition to the civilian–military cooperation, to improve the medical environment of the civilian populations among whom the force operates. For each mission, MSP is defined by the command that sets the level of civilian health care provided, according to the French doctrine. This doctrine dictates the principles of good practice of MSP so that it is effective, including the mastery of contributions (MSP must not impair the ability of the French Medical Health Service to act for the benefit of the forces, and it must be immediately reversible), lack of competition with the local health system or with international organizations, and the realization of ideally unique, short and efficient surgical procedures (by favoring outpatient surgery), performed under strict conditions of medical ethics and good medical practices.

If the main objective of the MSP remains assistance to populations, maintaining staff motivation through regular activity, using the means of health support, is nonetheless a strategic objective. Furthermore, it allows for the technical and mental preparation of operational support forces, the

development of teamwork, and the maintenance of staff motivation for missions, particularly during periods of low activity, when conflicts decrease in intensity. MSPs could also be considered a key strategic tool for improving the acceptance of the presence of armed forces and for convincing people that these forces can protect them, if needed. Over 10 years of the Ivorian conflict, France has played a significant political and military role on many occasions, sending troops at the very beginning of the conflict, providing assistance in establishing a national reconciliation government, assisting in the 2011 presidential election[1] and establishing MSP, which has facilitated the acceptance of the French military troops. Additionally, we believe that MSP has participated in maintaining good relations with local nationals, to "win hearts and minds,"[13] which is important in peacekeeping and stabilization missions without interfering with nongovernmental organizations.[14]

CONCLUSION

FSTs have a primary mission to support French military personnel, but they have widely contributed to MSP in the IC because it represents their second responsibility.[7] MSP requires limited resources (12 health care providers, a surgical, a postop, and a basic biological and radiological capability) but also standardization of the procedures to be reproduced by all surgeons. Pathologies with well-codified surgical indications and operations, requiring limited resources with predictable straightforward postoperative courses, must be always preferred. More difficult cases, such as cancers or burns, are so time- and material-consuming that doctrinal guidelines should be established to provide optimal care for these challenging patients. Restorative surgery for the limbs must be carefully considered, particularly when infection complicates a fracture. MSP requires specific skills beyond the original surgical specialty of military surgeons to fulfill the needs of local populations. As a result, in 2007, an Advanced Course for Deployment Surgery (Cours Avancé de CHIRurgie en Mission EXtérieure - CACHIRMEX) was established by the French Military Health Service Academy (Ecole du Val-de-Grâce) to fulfill the needs of military surgeons before deployment regarding the provision of care to civilian populations in military health care facilities or in austere environments. It is divided into five modules over a 2-year period: module one develops the organization of the French Medical Corps during abroad deployment, module five is specifically dedicated to the particular care of civilians as part of MSP (specificities of tropical digestive pathologies, gynecology, urology, management of orthopedic sequelae, and ethical principles), the other three modules cover opened or closed trauma of the limbs, head, neck, thorax, abdomen, and pelvis. In the future, developing collaborative mentoring schemes with local doctors should represent the positive evolution of military–civilian cooperation.

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