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PERSONAL EXPERIENCE

Inguinal hernia repair in a developing country

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Abstract Hernia surgery is typically same-day surgery and can be safely conducted in a developing country. We describe a collaborative effort of the American Hernia Society, the Institute of Latin American Concerns, medical industries, the United States Peace Corps, physicians, surgical residents and nurses from many institutions. During three 5-day periods, we operated on 236 patients and repaired 252 hernias (73% inguinal). In addition, an education day for local physicians was conducted on three occasions and included televised live surgical demonstrations and interactive lectures with question and answer sessions. We suggest this to be a viable public health initiative and demonstrate the role of surgeons in advancing and providing state-of-the-art inguinal hernia surgery to a developing country and its underserved population.

Keywords Inguinal hernia repair · Developing country

Introduction

Short-term surgical clinics provide a unique opportunity for surgeons to reach remote areas and have historically been used for cataract surgery [1, 2], vasectomies [3] and tubal ligations [4, 5]. Hernia surgery is typically same-day surgery and lends itself to surgical clinic implementation. Dr. Herszage of Buenos Aires, Argentina, recently demonstrated the efficacy of a hernia repair clinic in a remote rural setting [6].

Hernia surgery has seen many advances in techniques over the past few decades, and surgeons in developing countries are often not exposed to these due to lack of resources. In the current global age, there is an increasing need for collaborative efforts to provide care for underserved populations but also to empower local surgeons to provide state-of-the-art care within the framework of limited resources.

The Dominican Republic (population 8,745,000) is an independent nation with an average per capita annual health expenditure of US $295 [7]. There is a need for improved health care given the shortage of resources and limited patient accessibility. The Institution for Latin American Concerns (ILAC) is located in Santiago, Dominican Republic, and was founded as a Jesuit non-profit organization to provide collaborative healthcare and education. A new outpatient surgical facility with three operating rooms, ten examining rooms and a recovery area built by the Jesuits served as the facility for the hernia clinic.

Herein, we describe the organization issues, preparatory measures, team recruitment, equipment solicitation and procurement, patient management and aftercare.

Methods

The ILAC hernia clinic concept was first developed in 2003, and the process of planning and implementation occurred in 1.5 years. The impetus for this initiative was the establishment of an outpatient surgery suite at

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the ILAC center (2004) in collaboration with Creighton University. Nevertheless, qualified surgeons were needed and the American Hernia Society (AHS) was an obvious source for surgeon recruitment. Subsequently, a volunteer core proposal was made to the AHS board of directors and the motion was approved. Recruitment of experts was made possible by the immediate volunteering of Dr. Arthur Gilbert and Dr. Parviz Amid. Many of the AHS Corporate Council company representatives volunteered equipment without solicitation. This industry goodwill has been sustained with over US $100,000 of equipment being donated.

The initial stage also involved enlisting the assistance of ILAC health care workers (cooperadores) and physicians in identifying patients who would be suitable candidates for same-day surgery. Cooperadores are individuals selected from rural communities and educated by ILAC who screen and in some circumstances treat patients with health problems. The senior author (C.J.F.) traveled to the Dominican Republic initially to assure there were an adequate number of patients and the facility was appropriate for surgical intervention. He also educated the cooperadores with regard to indications for surgery and the hernia examination. Collaborative efforts were initiated with the local hospitals and physician leaders so that local surgeons could participate in the educational activities. Terri Lynch (RN), the ILAC Creighton University coordinator, was critical to the collaborative effort. She organized the ILAC leadership, including the board members and the cooperadores to assure adequate patient volume, a safe environment, good food, comfortable living conditions and evening entertainment on occasion.

The hernia clinics were conducted in three sessions—the first in November 2004, the second in April 2005 and the third in November 2005. The clinics lasted for 1 week each, with five operating days. Operations were performed between 0800 hours and 1700 hours. The choice of the repair was based on surgeon preference. Simultaneous outpatient center screening was ongoing for subsequent hernia clinics. Pre-operative evaluation for suitability of the procedure was carried out by local physicians and surgeons. Patients with significant co-morbidities were referred for further evaluation by a volunteer cardiologist, Dr. Joseph Lynch. Five patients who required an overnight stay due to late or extensive surgery were quartered in the ILAC center dormitories and were discharged the next morning after examination.

A moderated televised presentation of new and different repairs, including the Lichtenstein, Prolene Hernia System, Bassini and the Shouldice repair, was given on each Wednesday morning. A total of 60 surgeons, residents and medical students attended these three demonstration/lecture series and were able to interact with the operating surgeon by audio transmission during surgery. In the afternoon, each surgeon was also available for questions and answers. In addition, local surgery residents and surgeons were encouraged to scrub. Surgical residents from Creighton University traveled with the first two teams and assisted with almost all operations. They were able to directly observe and participate in techniques used by visiting faculty.

The Peace Corp volunteers (10–12 for each trip) were invaluable in providing translation, Spanish language conversations with the patients undergoing local anesthesia and many other odd jobs that improved efficiency in general. Their work, cooperation and dedication to the patients was an extraordinary example for all team members. These young people exhibited the best values of the United States.

Data analysis

The data was collected using standardized data forms after physician screening, and the surgeon conducted brief interviews and examinations of each patient in the pre-anesthesia area (Fig. 1). Data points were entered into an Excel spreadsheet using manual data entry and random checks incorporated to verify accuracy of entry. The data was analyzed using Intercooled Stata version 7.0 (Houston, TX, USA). An alpha level of 0.05 was considered significant, and standard *t*-tests, chi-square test and Fischer's modification were used.

Fig. 1 Aerial outlay of the surgical clinic, storage area and operating rooms

Results

The population that visited our clinic was predominantly male (71%), and the mean age (±SD) was 35.9±22.7 years (interquartile range 13–55 years). The majority of patients were Dominicans [225 (95%)] and six Haitian natives attended the clinic (we were unable to obtain the nationality of five patients).

We had limited initial data on the characteristics of the hernia due to recall bias and incomplete data forms. However, of the respondents, the mean duration of the hernia was 5±10.5 years (interquartile range 2–12 years). Of the patients, 51% (64 of 125 respondents to the question) noted that they had no pain at rest, while 16% noted severe pain. Severe pain was also reported during heavy activity by 55% of patients (64 of 114 respondents), while 11% experienced no pain with such activity. Some of the data for pain associated with the hernia was imputed using available data points. There was no association between the duration of the hernia being more than 5 years and pain encountered either at rest or with heavy activity (chi test, P=0.6). We also inquired about family history and noted that of the 182 responders, 43% had one relative who had a hernia, while 10% had more than one relative with a hernia.

In 236 patients, 269 operative procedures were performed, 87 at the first session, 79 at the second and 103 at the third. Of the 269 procedures, 252 (94%) were hernia repairs while the others were for hydroceles (n=2), thigh fibroma (n=1), orchidopexy (n=1), frenectomy (n=1) and lipomas (n=10). A variety of hernias were seen and different repairs were undertaken. The choice of the repair was left to the operating surgeon (Table 1). Of the hernias, we encountered 74 (31%) right inguinal hernias, 49 (21%) left inguinal hernias and 17 (7%) bilateral inguinal hernias (8 inguinal hernias with side not specified). We also repaired 5 femoral hernias, 2 Spiegelian hernias, 4 incisional hernias, 45 umbilical hernias, 31 epigastric hernias and 11 recurrent hernias, of which 1 was a femoral hernia. Of the patients, 49% were operated on under local anesthesia, while the remainder required general anesthesia; 24% of our population was younger than 12 years of age, and general anesthesia was administered by visiting anesthesia faculty. Of the adult population (>18 years), 66% had repairs under local anesthesia. However, we favored general anesthesia when bilateral hernia repairs were performed (13 of 17 procedures).

Table 1 Techniques employed in the repair of inguinal hernias

Plug and/or patch	10(6%)
Prolene hernia system	13(7%)
Lichtenstein repair	41(23%)
Sutureless mesh	20(11%)
Shouldice repair	4(2%)
Bassini repair	8(5%)
Kugel repair	20(11%)
Pediatric herniorrhaphy	30(17%)
Hernia repair not specified	31(18%)
Total	177(100%)

The duration of surgery was recorded for two of the three trips and hence we had data for 155 observations. The mean (±SD) duration of surgery was 55±29.7 min (interquartile range 35–73 min). The duration of surgery varied with the nature of surgery and was longer for bilateral than unilateral repairs (86±38 min vs 54.9±25.0 min, P=0.0003).

Of the various repairs performed, the majority were mesh repairs, done using the Lichtenstein technique [41 of 177 inguinal hernia repairs (23%)], the Prolene Hernia System [13 of 177 procedures (7.3%)], the Kugel repair [23 of 177 procedures (13%)] and a sutureless mesh technique [20 cases; no sutures placed to affix the mesh (11%)]. Important techniques of repair including the Bassini repair (5%) and Shouldice repair (2%) were also performed in selected patients (Table 1). Epigastric hernia and umbilical hernia repairs were performed using a variety of techniques. Large fascial defects required mesh prostheses. We did encounter two Spiegelian hernias, one of which was repaired primarily while the other was repaired with mesh. Of the 11 recurrent hernias, mesh was used in 10 and a high ligation of the sac was performed in 1. Of the mesh repairs, 2 were of the Lichtenstein type, 2 the plug mesh, 2 the Kugel patch, 1 the intra-peritoneal mesh, 1 the pre-peritoneal mesh, and 2 mesh repairs were unspecified. Intraoperative narcotics were used in 63% of all cases and antibiotics in 23% of operations. Of patients with recurrent hernias, 50% received antibiotics, and 21% of the remaining hernia patients received the same. The use of narcotics was directed by the anesthesiologist's preference, while the surgeon determined the need for antibiotics. Only Celebrex (Pfizer inc.) capsules were utilized for postoperative discomfort (Fig. 2).

Complications

Seven immediate complications were experienced in 236 patients (3%). One patient required re-operation for a post-operative hematoma, and 2 patients underwent a limited laparotomy for a serosal tear (incisional hernia) and a lost kittner sponge (large umbilical hernia), respectively. One patient with a large scrotal hernia developed a hematoma that required percutaneous

November 2004

April 2005

November 2005

Fig. 2 The teams for the three hernia trips

needle drainage, while another needed placement of a scrotal drain. A bladder laceration was encountered during one hernia repair and this was primarily repaired with a drain left in place. One patient, after an uneventful repair, was noted to have hyperglycemia and on further investigation was found to have severe anemia, which had not been known pre-operatively. The patient was transferred to a local facility and was found to have aplastic anemia. She eventually did well with packed cell and platelet transfusions. Another patient developed a post-operative seroma and, at re-operation at a local hospital, an orchiectomy was performed. The status of the testicle at removal is unknown. There were no short-term recurrences of hernias reported.

Discussion

We report our experience with three surgery hernia clinics organized by a multi-institutional collaboration group. The Dominican Republic seemed a logical choice given the modern operating rooms and examining rooms available. We were able to recruit both surgeons and patients for a short-term effort and successfully carry out hernia operations in 236 patients. We did lack the use of laparoscopic surgical repair, which has become more widespread in some communities for bilateral and recurrent hernias [8, 9] but, with recent evidence suggesting that primary open repair is equivalent if not superior to laparoscopic repair, we did not believe that the quality of care was compromised.

Data collection and follow-up were limited by the language barrier, patient attrition rate, and to provider and patient recall bias. We have since initiated measures to improve data collection in subsequent hernia clinics and have also enlisted the help of local physicians in documenting follow-up visits.

The long-term benefit of the hernia surgery clinic program is the education of local surgeons. The involvement of Dominican surgeons and surgical residents was formalized by combining didactic lectures with telecommunicated operations. This provided exposure to expert herniologists and an understanding of the current techniques of hernia repair. As a result of the educational efforts, there has been an increased availability and utilization of prosthetic materials for hernia repair in the Dominican Republic and a continued receptivity for further education.

The many volunteers are listed in Table 2. Recruitment was almost effortless. Table 3 lists the industry members that contributed mesh materials and equipment. This long list demonstrates the generosity of key individuals and their respective companies. Of utmost importance, however, was the untiring work of the founding priest, Father Ernest Travieso, the ILAC board members who have given so generously and the many ILAC workers. Their dedication to the Domini-

Table 2 List of participants

Surgeons	Surgical residents	ILAC organizers and volunteers
1. Dr. P. Amid	1. Dr. B. Amirlak	1. Dr. L. Carretero
2. Dr. G. Campanelli	2. Dr. H. S. Ahluwalia	2. Mike Chase
3. Dr. S. Cemaj	3. Dr. N. Garg	3. Dr. R. A. DeLeon
4. Dr. C. Filipi	4. Dr. N. Jaszczak	4. Mike Elliot
5. Dr. R. Fitzgibbons Jr.	5. Dr. K. K.Turaga	5. Naeda Elliot
6. Dr. S. Fletcher		6. Dr. A. Goeser PharmD
7. Dr. A. Gilbert		7. Dr. Joseph Lynch
8. Dr. R. Kugel		8. Terri Lynch
9. Dr. E. Molina		9. Dr. and Mrs. Martinez
10. Dr. E. Nicolo		10. Dr. G. Medina
11. Dr. W. Reinpold		11. Radalme Pena
Anesthesiologists/ Nurse anesthetists	Nurses and operating room technicians	12. Athina Schmidt
1. Dr. K. Babcock	1. Carol Bruner	13. Dr. D. Schmidt PharmD
2. Dr. M. D'Agostino	2. Nancy Cassario	14. Jeff Spragens
3. Dr. K. Eckhart	3. Mary Corkle RN	15. Eduardo Villanueva
4. Dr. G. Evans	4. Barb Elliot RN	
5. Theresa Keefe CAN	5. Frances A. Filipi RN	
6. Dr. H. Logginidou	6. Karen Fitzgibbons RN	
7. Dr. J. Manion	7. Dave Hackett	
8. Dr. J. Muller	8. Juanita Henrich	
9. Dr. A. Pelizzola	9. Kandice Keller RN	
	10. Marie Kelley RN	
	11. Carol A. Lasch RN	
	12. Pat Manion RN	
	13. Jan Redick RN	
	14. Kirill Skrypnik	
	15. Mike Szapacs	
	16. Paulette Stoll RN	
	17. Feryat Taser	
	18. Phyllis Theirstein	
	19. Rose Tselentis	
	20. Karla Ziesemer RN	

Table 3 Donating medical industries

1. 3M industries	12. Kendall
2. Aesculap instruments	13. Kimberly Clarks
3. Americares	14. Medical Action Industries
4. Astra Zeneca	15. Midmark Sterilizers
5. Atrium	16. Molnlycke Healthcare
6. Bard Inc.	17. American Hernia Society
7. Cardinal Health	18. Ohmeda Pulse oximeter probes
8. Conmed	19. Pfizer Inc
9. Creighton University Medical Center	20. US Surgical
10. Davol	21. W. L. Gore
11. Ethicon Inc	

can people, through the work of the cooperadores, is inspiring and should serve as a model for other charitable organizations. The cooperadores concept was the inspiration of Father Ernest Travieso.

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