

A Successful Model for Laparoscopic Training in Mongolia

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ABSTRACT

Background:

Laparoscopic surgery was introduced in Mongolia in 1994, yet due to difficult geography and extremely limited resources the benefits of laparoscopic surgery have not been available to the majority of the country. Mongolian surgical leaders recognized the high incidence of gallbladder disease and the disparity in access to modern surgical care and requested assistance in expanding laparoscopy to rural Mongolia. A capacity building approach for sustainable trans-cultural and trans-professional transfer of knowledge for laparoscopic cholecystectomy throughout the four rural regional diagnostic referral centers in Mongolia is reviewed.

Method:

Laparoscopic cholecystectomy training was initiated by the local Mongolian surgical community. The course included a didactic one-day course followed by an intensive 2-week practical operating experience, which integrated a team approach to training the surgeons, anesthesiologists, operating room nurses and technicians, and bio-technicians. Training courses were organized and taught in Ulaanbataar at Hospitals # 1 and # 2, and at three of the four RDRTC's in Erdenet, Khovd, and Choibalsan from 2006 to 2010. Every facility received two training visits.

Results:

A total of 303 laparoscopic cholecystectomies were performed during the practical components of the courses from 2006-2010. The female to male ration was 3.7:1. There was one common bile duct injury (0.33%) and one duodenal injury (0.33%). The conversion rate was 2.0%. From 2005-2008 in Khovd and Choibalsan, all gallbladders were removed by the open technique. The overall frequency of cholecystectomy as well as the number performed laparoscopically has increased in these facilities since training course began. Increased collaboration between urban and rural Mongolian surgeons has increased. Mongolian surgeons have had the opportunity to developed new skills and become leaders in the advancement of laparoscopy in their local communities.

Conclusion:

This program has been successful in creating a self-sustaining practice of training and advancement of surgical skills in Mongolia. The traditional surgical approach to gallbladder disease has been challenged and has in turn been a stimulus for local improvement in the medical community.

INTRODUCTION

Cholecystectomy is one of the most common operations performed worldwide (Thomas, Singh et al. 2001). Laparoscopic cholecystectomy revolutionized the care of gallbladder disease allowing for faster recovery, shorter hospitalizations, decreased wound infections, and decreased use of narcotic medications. In developed countries, laparoscopic cholecystectomy has now become the gold standard in the treatment of gallstones. However, open cholecystectomy with its increased morbidity remains the standard of care due to limitations on training, cost, and availability of equipment. The benefits of laparoscopic surgery elude much of the developing world where people often accept several painful conditions as a fact of life.

In Mongolia, 49% of the 2.7 million people still reside in rural areas and live a nomadic lifestyle. (Gunsentsoodol, Nachin et al. 2006) Mongolia covers a large geographic area equal to the combined areas of Great Britain, France, Germany, and Italy; Mongolia is the most sparsely populated country in the world. The dry deserts and wet mountains coupled with the extremes of weather are significant obstacles to adequate road building and impede transportation for patients in need. The vast rural areas of Mongolia are isolated and present a serious challenge to providing access to adequate medical and surgical care.

In 2006, expenditures for health care reached 4.6% of the gross domestic product of Mongolia; this translated into US \$23.2 per capita for health care per year. (Gunsentsoodol, Nachin et al. 2006) Weiser et. al. found that surgery is almost absent in countries where less than US \$100 is spent on health care per person per year. (Weiser, Regenbogen et al. 2008) Laparoscopic cholecystectomy was first introduced into Mongolia in 1994, but by 2005 only 2% of the gallbladders were removed laparoscopically and none were performed outside of the capital city, Ulaanbataar. (Rusher 1999; Straub, Price et al. 2011)

The epidemiology of diseases in Mongolia has dramatically changed over the last three decades. Where echinococcal disease was one of the leading surgical diagnoses in the early 1960's, it is now uncommon. Today, the second most common cause of hospital

morbidity in Mongolia is gastrointestinal diseases with liver diseases, appendicitis and gallbladder disease representing the majority of these illnesses. A cohort study in Mongolia in 2006 comparing the few laparoscopic cholecystectomies to the many open cholecystectomies found that the laparoscopic approach afforded patients lower infection rates, shorter hospitalizations, and provided hospitals cost savings. (Sergelen 2006)

Mongolia is divided into 21 geographic/administrative areas called Aimag's. In the early 2000's, the Ministry of Health of Mongolia, in an effort to increase access to improved medical and surgical care to the rural areas throughout Mongolia, designated four of the Aimag hospitals as Regional Diagnostic Referral and Treatment Centers (RDRTC) and targeted them for improved infrastructure and human resource development.

Despite the obvious concerns of inadequate physical and human resources, difficult travel, and relatively limited financial investment in healthcare, the chief of surgery at the Health Sciences University of Mongolia, recognizing the need for improved treatment for gallbladder disease, requested assistance from the Swanson Family Foundation (a non-profit, non-denominational, non-governmental organization (NGO) that had been helping to develop and improve the infrastructure of hospitals in Mongolia since 1999) to help expand laparoscopic cholecystectomy to these four RDRTC's. This paper reviews the teaching methods and important concepts learned over the last seven years in expanding laparoscopy in a sustainable manner throughout Mongolia (Straub, Price et al. 2011).

METHODS

In collaboration with the Health Science University of Mongolia (HSUM), the Ministry of Health of Mongolia, and the Swanson Family Foundation (SFF), a comprehensive multidisciplinary two-week laparoscopic cholecystectomy training course was developed. The organizational components included: (1) Maneuvering the local political and medical system including importation laws and agreements and licensing the surgeons on the teaching team; (2) Developing and translating an appropriate didactic curriculum; (3) Organizing a functional practical component of the course that trains all important team members and provides a continuum of training including pre-, intra- and post-operative

management; and (4) Implementing methods for sustainable infrastructure development that supports laparoscopy in a resource poor environment.

1. Maneuvering the Political and Medical Regulatory Environment in Mongolia

To facilitate the constant changing laws and regulations, a local Mongolian expert was hired as an in-country facilitator and representative for the Swanson Family Foundation. Agreements through the Ministry of Health and support from local political representatives were forged leading to critical long-term alliances that facilitated the import of the necessary laparoscopic and other medical supplies. Also, appropriate medical licenses were obtained through the Ministry of Health and the National Mongolian Surgical Society for the foreign surgeons. Dr. Sergelen, the Chief of Surgery at HSUM, was instrumental in obtaining the licenses as well as organizing the Mongolian doctors, nurses, and administrators for the courses at the various facilities each year.

2. Developing the Didactic Curriculum

The course combined both didactic and practical sessions. The laparoscopic didactic lectures were given either the first day, or over several days in the morning. The initial topics for the laparoscopic didactic course were developed through discussions between the chief of surgery at HSUM and the medical director for the SFF. The topics included basic and laparoscopic training as the first course was scheduled for Hospital #1 where laparoscopy had begun in 1994. (Figure 1) Later, with permission from the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), the didactic lectures from the Fundamentals of Laparoscopic Surgery course replaced some of the initial lectures for the courses taught in the RDRTC's and other medical centers. This combined with lectures on basic laparoscopy skills, sterile technique, and surgical safety as outlined by the World Health Organization (WHO) surgical safety checklist provided a total of eight hours of didactic lectures. (Figure 2) All lectures and presentations were translated into Mongolian. Medical translation for the PowerPoint slides and during the actual course proved to be a significant hurdle solved by collaborating with native surgeons and other physicians who were bilingual in Mongolian and English from the tertiary care centers in the capital city. Following the direction of Dr. Sergelen, an Emergency Surgery didactic

lecture series was also developed and included during the complete two week training courses at the RDRTC's. Surgeons and nurses from different surgical specialties (orthopedics, obstetrics and gynecology, etc) attended the didactic portions of the course.

3. Organizing the Practical Training Component

The first laparoscopic course in 2006 included one week of laparoscopic cholecystectomy (LC) experience and one week of advanced laparoscopic (AL) surgical procedures (colectomies, an adrenalectomy, a Nissen fundoplication). From 2007-2010, all of the practical laparoscopic training components have focused on laparoscopic cholecystectomy with a few appendectomies. The LC practical portion of the course provided general surgeons with five days of hands on experience performing laparoscopic cholecystectomies in two different operating rooms. The experience was initially designed to provide 2-3 Mongolian surgeons per operating room the opportunity to gradually learn the laparoscopic skills progressing from camera holder then advancing to first assistant and finally to lead surgeon. It was politically very difficult to limit the numbers of surgeons participating in this first practical session. Many Mongolian surgeons assisted, but few gained enough experience to allow them to act as the lead surgeon. Future courses were able to select the few surgeons who would receive the operative practical experience before the teams arrived allowing for very intensive, focused training with the graduated approach. The numbers of teaching LC's were also decreased to 3 (or rarely 4) cases, from 6, per day for each operating room as 6 cases overwhelmed local resources and staff. Relatively few course participants had received prior training either by foreign surgeons visiting Mongolia or by traveling to other countries for training.

Each course included a multidisciplinary education team consisting of two surgeons, an anesthesiologist, an operating room nurse, an operating room scrub technician, and a bio-technician. A surgical resident frequently joined the team to facilitate research and patient improvement projects. Each team member was tasked with training his/her Mongolian counterpart about the specifics of laparoscopic surgery from their perspective. This included not only the intra-operative training, but also the pre- and post-operative management of the patients and the care and cleaning of the equipment. Bio-technicians

trained their counterparts on maintenance and repair of the equipment and helped identify sustainable ways to replace and upgrade equipment.

Inanimate laparoscopic skill simulator boxes have been added to the practical component of the course during the last two years. (2009-2010).

Due to the infrastructure of the health care system in Mongolia, training began first in the capitol city of Ulaanbaatar (UB) where tertiary care is provided. Training was subsequently expanded to the regional centers in three of the four regional diagnostic referral centers (Erdenet, Khovd, and Choibalsan), and the fourth scheduled for training in June 2011(Uvukhanghai). Each education site received an initial training course and a follow-up course the next year. (The initial course in Choibalsan was just completed in 2010). Participants were issued a certificate of completion signed by the President of the National Mongolian Surgical Society and the Medical Director of the SFF at the conclusion of the course. This did not imply any competency, but supported the Mongolian national standards for required continuing medical education.

During the two weeks of laparoscopic training, any emergency and trauma cases at that facility were managed together with the local Mongolian surgical team and the visiting surgical education team. This included the pre-, intra-, and post-operative management with daily combined team rounds morning and night. Some patients with appendicitis were offered the laparoscopic approach to begin expanding the students' laparoscopic skills. Traditional open surgical procedures were done for all other emergency cases.

4. Infrastructure Development

As laparoscopy requires a totally different set of equipment and instruments, and none of the RDRTC's had any of this equipment, each of the courses included on-site evaluations. Hospital infrastructure was assessed including suitability of power source, status of basic surgical equipment (instruments, cautery, suction, anesthesia machines, operating room lights and beds, autoclaves and other sterilization methods), and supplies (suture, bandages, medicines). The SFF supplied the necessary infrastructure initially using equipment obtained from US hospitals that were refurbished to meet US standards. Working with industry, new equipment and supplies were donated. Containers were

shipped months in advance of the education teams and then installed in the hospitals working with the local Mongolian counterparts. Laparoscopic towers and equipment were installed in each facility (Hospital # 1, Hospital #2, Erdenet, Khovd) prior to the training through the SFF except in Choibalsan where a Belgium project had installed some equipment the previous year and began laparoscopic training there. Additional laparoscopic equipment was installed by the SFF. Operating room tables, anesthesia machines, autoclaves, electro cautery machines, open surgical instruments, and open retractors were also donated. Partnerships with industry have begun establishing local vendors in Ulaanbataar to help maintain and provide sources for continued training, supplies, and equipment.

5. Evaluation

Data was prospectively collected on the numbers of students attending the courses. Patient demographics were collected prospectively on all patients during the training course. Complications were identified prospectively and confirmed with a retrospective follow-up after the courses.

Patient demographics (age and gender), ultrasound findings, procedure type (open vs. laparoscopic vs. conversion), surgeon (trainee vs. trainer), intraoperative complications, postoperative complications. Hospital records from January 2005 to September 2010 were reviewed in two of the three regional centers (Khovd and Choibalsan) for all cholecystectomies and the following data was collected: patient age, gender, preoperative diagnosis, type of procedure, and surgeon. Data collected from Erdenet has recently been published. ((Straub, Price et al. 2011))

RESULTS

All foreign surgeons and anesthesiologists were able to obtain a medical license while in Mongolia (Figure 4).

Training courses were organized and taught in Ulaanbataar at Hospitals # 1 and # 2, and at three of the four RDRTC's in Erdenet, Khovd, and Choibalsan from 2006 to 2010. Table 2 indicates the number of students in the didactic courses and the number of

surgeons who participated in the practical portions. Erdenet, Khovd, and Choibalsan each only had four active general surgeons all of which completed the practical training. Course taught at Hospitals # 1 and 2 included students from multiple hospitals throughout Mongolia including the Chief of Surgery from Choibalsan.

A total of 303 laparoscopic cholecystectomies were performed during the practical components of the courses from 2006-2010. The female to male ration was 3.7:1. All patients' gallstones were identified preoperatively on ultrasound. There was one common bile duct injury (0.33%) and one duodenal injury (0.33%). The conversion rate was 2.0%. (Table 1) Intra-operative cholangiogram technique was taught during 3 cases in Choibalsan as it was the first facility that had the capability for intra-operative x-ray during our training courses.

From 2005-2008 in Khovd and Choibalsan, all gallbladders were removed by the open technique. The overall frequency of cholecystectomy as well as the number performed laparoscopically has increased in these facilities since training began in 2009 (Figure 5 and 6).

An endocrine surgeon who assisted during the laparoscopic adrenalectomy in 2006 received further training in Korea, and a year later had led their Mongolian team in performing their first laparoscopic adrenalectomy.

The colo-rectal surgeon and the endocrine surgeon trained during the advanced laparoscopic portion of the 2006 course became part of the SFF education team in Erdenet. Two other surgeons from the 2006 laparoscopic cholecystectomy course also joined the SFF teams to teach in Khovd and Choibalsan. These surgeons have facilitated follow-up onsite proctoring and provided short-term fellowships at their facilities to continue the training of the surgeons from these regional hospitals.

In addition, the colo-rectal surgeon has become the medical director of a new private hospital, Songdo Hospital, a new private Korean hospital in Ulaanbataar, where he performed nearly 100 laparoscopic colectomies in 2010.

DISCUSSION

The introduction of laparoscopy in resource poor areas has been a topic of some debate. Some have argued that the introduction of laparoscopy in developing countries does not contribute to the improvement of quality and effectiveness of surgical care unless basic and essential surgical and anesthetic services are strengthened in parallel and that perhaps the drive for laparoscopy is driven by industry or academia and not the public's demand (Contini, Taqdeer et al. 2010). Others suggest that the benefits of laparoscopy, faster return to work, less pain, and fewer infections, may actually be more important in the developing world leading to improved productivity in an already fragile economic environment (Alfa-Wali and Antoniou 2010).

Laparoscopy had previously been introduced into Mongolia in 1994 but 10 years later, very few laparoscopic cholecystectomies were being performed. Barriers to the expansion of laparoscopy included the lack of adequate training and significant limited resources, especially in the rural regions. In Mongolia, the impetus for the expansion of a laparoscopic program resulted from a concerted campaign from the local surgical community to address a critical need for their country. The partnership created between the Health Sciences University of Mongolia and the Swanson Family Foundation to teach laparoscopy as well as the continued support of the entire surgical community has been an extremely important concept for the successful and sustainable introduction of laparoscopy in Mongolia.

Many lessons were learned from the initial course taught in 2006 as the teams had to carefully navigate the cultural and medical political nuances. In Mongolia, physicians are trained in a system where they learn by watching and only sometimes assisting. Despite the pre-designed curriculum, this led to many surgeons each assisting during the practical component of the laparoscopic cholecystectomy training without providing anyone with enough experience to competently perform a laparoscopic cholecystectomy independently. In order for the training to be effective, local leaders had to be convinced that a different method of teaching was required; training two surgeons in one OR over several days progressing through a graduated experience would allow the surgeons to become somewhat proficient in the technique. The chief of surgery, Dr.

Sergelen, commented in 2009 that one of the most important aspects of the training program has been the introduction of a new way to teach surgery in Mongolia—a “hands-on” approach that allows the surgeons to “do” rather than just “watch”—leading to a more rapid acquisition of new surgical skills. It was much easier to consolidate the practical training in Erdenet, Khovd, and Choibalsan as each facility had only 4 general surgeons and had selected two for the majority of the operative experience.

Understanding the limitations imposed by the medical system’s infrastructure was another lesson learned during the 2006 course. Sterilization of instruments to allow rapid turnover of the operating room was a limiting factor. Lack of adequate human resources and time as well as the concern of inadequate sterilization and transmission of infectious diseases if the system was strained forced us to re-evaluate the feasibility of performing a large volume of cases. To overcome this problem, the number of procedures being done per day was decreased by nearly half and enough scopes and instruments are now taken to each site to allow adequate sterilization to safely facilitate 3-4 laparoscopic cases per day.

Combining emergency and essential surgical training in parallel with the laparoscopic training for the RDRTC’s indeed has allowed for culturally acceptable methods to improve surgical care in general. Teaching laparoscopic surgery not only led to the expansion of more modern surgical techniques to rural Mongolia, but it has also enabled improved reception for basic surgical training that in addition to improved decision making and technical abilities of the surgical team, has included the acceptance of sterile technique courses and the implementation of surgical safety measures such as incorporating the surgical checklist and implementing a “time out” at the beginning of the cases. By providing the surgeons in Mongolia with the training they requested, trust has been gained which has allowed for the introduction of training in trauma surgery, emergency surgery, and pediatric surgery and anesthesia in addition to laparoscopy.

Several studies in developing nations have documented both the feasibility and safety of performing laparoscopic cholecystectomies (Udwadia, Patil et al. 1992; al Hadi, Chiedozi

et al. 1998; Brekalo, Innocenti et al. 2007). With careful patient selection, the safety of same day laparoscopic cholecystectomy has also been established (Thomas, Singh et al. 2001; Bal, Reddy et al. 2003; Chauhan, Mehrotra et al. 2006). The majority of this experience has been carried out in tertiary care centers and has not been well studied in rural centers. As with the experience in developed countries, there is a learning curve for the mastery of laparoscopic skills. Complication and conversion rates in Mongolia are consistent with those seen at the inception of laparoscopy in the 1990s (Straub, Price et al. 2011).

One might expect the complication rate might be elevated during the practical portion of the training period where surgeons learning laparoscopy have not had previous experience. However, the common bile duct injury rate and duodenal/ bowel injury rate is extremely low during the 303 laparoscopic cholecystectomy cases. A majority of these are with the Mongolian surgeons operating in the role of surgeon with the trainer as the assistant. Although converting to an open procedure is taught as good clinical judgment and not a complication, the conversion rate has been extremely low as well during the training courses. An initial report of complication and conversion rates in Ulaanbataar and Erdenet indicated acceptable rates following the trainings.(Straub, Price et al. 2011)

The multidisciplinary team approach, teaching comprehensive surgical care (pre, intra, and post operative care), and introducing twice daily team rounds with surgery, anesthesia, and nursing was one of the features most appreciated by our hosts. A significant amount of time was spent discussing and reviewing the appropriate work up and selection of patients for surgery. Teaching appropriate patient selection and criteria for the safe administration of anesthesia provided excellent opportunities to improve perioperative care. The notion that a patient scheduled for surgery should be cancelled if not medically optimized has been an important concept taught during all of the courses. The post-operative management included in the training has been facilitated by improving monitoring capabilities of each facility. An important aspect of this course includes training for each person involved in laparoscopy including the central processing people for sterilizing the equipment, operating room personnel who clean the instruments, administrators who provide financial and leadership support to replace and

repair the equipment, as well as the bio-technical support personnel who maintain and trouble shoot the equipment in the operating room.

Laparoscopy has been a gateway to improve the infrastructure of tertiary and regional care centers. In a recent report from Erdenet, the improved infrastructure has allowed the hospital there to increase the volume of surgeries performed and to do a larger variety of cases. Subsequently, they report that wait lists for surgery have dropped dramatically and infection rates have improved. In Khovd and Choibalsan, the overall numbers of cholecystectomies has been increasing as well as the numbers performed laparoscopically. It is hard to think that the incidence of gallbladder disease is increasing this dramatically. The increase in cholecystectomy may reflect the improved infrastructure that lends itself to increased capability. It may also represent the increased skills of the surgeons and their willingness to perform the surgery.

Prior to our training courses in 2006, many of the Mongolian people, especially those in the rural areas, were very skeptical about laparoscopic surgery. Just as the support of the medical community is necessary for a program of this type to thrive, the public must also be educated about the new technology and its benefits. A task of this magnitude would not succeed in an environment where the community is distrustful of the technology or apprehensive of its benefits. Therefore, a component of this project included public education utilizing the local media to dispel myths and to clarify the purpose and intent of the mission. The rise in gallbladder surgery may also reflect the general population's increasing acceptance of laparoscopy. The training has led to many patients commenting that their trust in their surgeons has increased dramatically leading to their willingness to undergo surgery in these facilities. The surgeons in Erdenet expressed that by educating the general population on the benefits of laparoscopy, the public will begin to demand increased access to laparoscopy and initiate lobbying efforts to increase funding from the government to support and sustain this technology.

The ultimate goal of this program has been to provide Mongolian surgeons with the tools and skills necessary to advance the medical and surgical care of their country. Professors from the university were recruited to translate and assist in the training of their rural colleagues. This was a vital component of the program as it helped foster a mentoring

relationship between academic and rural surgeons. The program was designed to accommodate two visits to each training site in consecutive years. Some of the course participants had received laparoscopic training from other visiting foreign medical teams prior to participating in one of our courses. Moreover, many surgeons sought additional training opportunities abroad after participation in the course. Laparoscopic training in Mongolia has been an enabling process that has provided the local surgeons with an improved confidence and self-satisfaction; they can now provide modern surgical care for their people similar to the care available in other parts of the world!

A multidisciplinary team approach including representatives from industry is essential in creating a sustainable and practical program. While equipment can be donated it is critical to supply these nations with technological back up and training in maintenance of the equipment so that they may evolve their medical centers at their own pace (Gandhi, Johari et al. 1992). In order to avoid the so-called “brain drain,” it is important to train surgeons in their own environment and the training must be adapted to meet the needs of the population (Friedell 1972). While the medical infrastructure of most developing countries is in need of improvement in several areas, this should not be viewed as a contraindication to the introduction new techniques. Laparoscopy should be viewed as an extension of general surgery and not a different type of surgery (Udwadia 2006).

With the ubiquitous access to information available on the internet and other media sources, the global community is understanding new possibilities for improving their access to quality surgical care and is demanding the benefits from minimally invasive surgery. Overcoming barriers of limited resources and human capital to develop laparoscopy can be achieved in communities where they feel the benefits are significant and they have the motivation to maintain it. This education model has provided direct training to surgical teams in the capital and the Regional Diagnostic Referral and Treatment Centers in Mongolia as requested by the Mongolian surgical leaders subsequently, this has provided improved access to modern surgical care in rural Mongolia. The focused training on laparoscopic cholecystectomy in a country that has a high prevalence of the disease has allowed for adequate practical experience during short term training expeditions. Team training, infrastructure development, integration of

laparoscopic training with essential and emergency surgical care, and partnering with local laparoscopic leaders have been key to the successful and sustained laparoscopic development in Mongolia.

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