



Who should be repairing these hernias? Level of expertise?

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Abstract: Hiatal hernias are commonly seen in patients presenting with GERD. Surgical management of patients with hiatal hernias remains a challenge given the lack of general consensus on management and operative technique. This has led to gaps in quality and outcomes of care in these patients. Variable levels of knowledge, experience, and expertise among practitioners has resulted in extreme deviations in preoperative evaluation, procedural technique, follow-up, and outcomes, that led to poor confidence in surgical management of GERD and hiatal hernias. We performed a literature review of contemporary and latest studies compiled in review format. The conclusions we made from our review of the literature were that foregut surgeons need to have a comprehensive understanding of foregut physiology and coordinate a thorough preoperative evaluation including independent interpretation of esophageal physiologic testing and the ability to perform endoscopy. Foregut surgeons should have specialized expertise and training in benign foregut procedures, minimally invasive techniques, and have a commitment to long term follow up. Ideally these complex operations would be completed by a minimally invasive trained surgeon at a high-volume center as improved outcomes and decreased costs have been associated with laparoscopic technique and increased surgeon/hospital volume. A multidisciplinary approach should be utilized when feasible.

Keywords: Hiatal hernia; paraesophageal hernia; hiatal hernia repair; paraesophageal hernia repair; foregut surgeon

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Hiatal hernias are commonly seen in patients presenting with gastroesophageal reflux disease (GERD) and approximately 5% of these are larger paraesophageal hernias (PEH) (1). With increased rates of central obesity and patient lifespan, surgeons are expected to see an increase in hiatal hernia incidence in the US population (2). Unfortunately, the surgical management of patients with hiatal hernias remains a challenge given the lack of general consensus on management and operative technique, which has ultimately led to gaps in quality and outcomes of care in these patients. Variable levels of knowledge, experience, and expertise among practitioners has resulted in extreme deviations in preoperative evaluation, procedural technique, follow-up, and outcomes, that led to poor confidence in

surgical management of GERD and hiatal hernias. In order to improve the quality of surgical care and reestablish confidence in surgical therapy, it is important for the surgical community to develop a consensus for who should be performing these complicated operations as well as to establish best practices for successful outcomes. First, it is imperative that foregut surgeons have a comprehensive understanding of foregut physiology and coordinate a thorough preoperative evaluation. Specific to preoperative evaluation, foregut surgeons should have the knowledge to independently interpret esophageal physiologic testing and the ability to perform endoscopy. Surgeons should have specialized expertise and training in benign foregut procedures, minimally invasive techniques, and have a

commitment to long-term follow-up.

Hiatal hernias, including PEH, pose a unique challenge given the complexity of the technical aspects of surgery and in the operative decision making. Surgeons undertaking these operations need to be able to effectively execute key steps of a paraesophageal hernia repair which include complete sac excision, adequate crural closure, sufficient esophageal mobilization in order to establish significant intra-abdominal length, and routine performance of anti-reflux procedures. With renewed interest in routine and complete mediastinal dissection, both as a way of decreasing the need for an esophageal lengthening procedure and also improving recurrence rates, surgeons should be comfortable with this approach (3). The complexity in decision making for patients with larger PEH is even higher where the presence of esophageal shortening is more likely (4). Because there is no preoperative test available to predict which patients have esophageal shortening, surgeons performing hiatal hernia repairs should be able to recognize and execute an elongation gastropasty when needed to provide a tension-free repair. Knowledge of different types of anti-reflux surgery is imperative for surgeons performing hiatal hernia repairs because technical experience allows for improved long-term symptom control. There are also varying degrees of support for adjuncts such as relaxing incisions, mesh implantation, and magnetic sphincter augmentation. It is important for foregut surgeons to be cognizant of when these adjuncts can be used effectively.

The two main approaches to repairing hiatal hernias are through the abdominal or thoracic cavities. Historically, these hernias have been repaired using an open approach but with the increased focus and training in minimally invasive surgery (MIS) techniques, there has been a significant shift toward laparoscopic or thoracoscopic repairs. MIS has consistently been shown to have improved outcomes and reduced cost (5,6). When specifically looking at laparoscopic paraesophageal hernia repairs (LPEHR) Mungo *et al.* was able to show that LPEHRs were associated with lower postoperative morbidity, 30-day mortality, and a shorter length of hospital stay when compared to open abdominal and thoracic approaches (7). Similarly, using the National Inpatient Sample, Schlottmann *et al.* compared both open abdominal and thoracic PEH repairs to minimally invasive abdominal and thoracic PEH repairs and found that MIS technique resulted in less postoperative complications, lower inpatient mortality, shorter length of hospital stay, and lower costs (8). Even in the emergency setting in patients without perforation, the laparoscopic technique is

safe and feasible if performed by experienced surgeons (9). Comparing laparoscopic and thoracoscopic approaches, Schlottmann *et al.* found that the laparoscopic approach had a significantly lower incidence of venous thromboembolism, infection, respiratory failure, shock, hospital length of stay, and overall hospital costs than the thoracoscopic approach (8). Gambhir *et al.* investigated whether surgeon specialty influenced outcomes after LPEHR and showed no significant difference in morbidity or mortality between general or thoracic surgeons. However, they did find that patients with procedures performed by general surgeons had a shorter length of stay and lower hospital costs (10). With advances in technology, robotic surgery is becoming more commonly used for anti-reflux surgery. Sarkaria *et al.* compared outcomes between robotic anti-reflux surgery and conventional laparoscopic approach and found similar outcomes (11). Although not specific to PEH, it seems that offering patients robotic hiatal hernia repairs is reasonable so long as the basic tenets of the operation are followed.

Despite favorable longer term patient satisfaction and improved quality of life scores with hiatal hernia repairs, up to 3–10% of patients have symptomatic recurrences requiring reoperation (12,13). During surgical reintervention, distortion of anatomy from both scar tissue and the previous repair adds to the complexity of the procedure with morbidity and mortality rates up to 20% (14). Surgeons performing revisional foregut surgery should be knowledgeable in and prepared to perform an esophageal or gastric resection and execute a roux en Y reconstruction if indicated. This highlights the need for surgeons with advanced expertise and experience to perform these operations. Zahiri *et al.* compared their clinical and patient reported outcomes for both primary LPEHR and revisional LPEHR at a tertiary, high volume center and found no difference in overall complications and comparable quality of life outcomes (15). Again, these improved outcomes seen by Zahiri emphasize the importance of advanced training for surgeons performing these operations and the need for a high-volume center specializing in the treatment of complex foregut diseases.

There has been a long established volume to outcome relationship for both the surgeon and hospital volumes for complex surgical operations (16–18). In the current climate of value-based care (value = outcomes that matter to patients/total cost of care episode), it is important for our profession and specialty societies to ensure that those who deliver that care are best equipped to do so. Initially after the advent of laparoscopic surgery over two decades

ago, there was significant interest in the learning curve associated with this technique. Criteria used to evaluate this learning curve traditionally included operative times, blood loss, open conversion rates, length of stay, and early complications requiring reoperation. These outcomes have been consistently shown to improve with surgeon experience (19–22). Soot *et al.* specifically evaluated the learning curve in laparoscopic fundoplication and found acceptable training case volume to overcome the learning curve is around 25 cases and improvements continue to be seen after 100 cases (23). This suggests that in order to be proficient, 25 cases should be adequate, but to be considered an expert surgeon, 100 cases need to have been performed. No studies have been performed specifically in laparoscopic anti-reflux surgery (LARS) to suggest a case volume needed to maintain level of expertise, but improved outcomes have been seen in high-volume centers suggesting that volume matters. Colavita and colleagues examined regionalization of LARS and found that high-volume centers (>38 procedures per year) had fewer complications, lower mortality, shorter length of hospital stay, lower total cost, and more routine discharges (24). This finding was reproduced by Schlottmann *et al.*, although they defined high volume center as >25 procedures per year (25). It is inconsistent in the literature what threshold should be used to define high volume centers, but our opinion is that surgeons who offer LARS should be performing >25 procedures per year. Specific to PEH, many groups have looked at the relationship of volume to outcomes. Antiporda *et al.* studied factors contributing to hiatal hernia recurrence rate after large paraesophageal hernia repair and found that low volume surgeons (<10 procedures per year) had a significantly higher early recurrence rate compared to high volume surgeons (26). Whealon *et al.* also compared low- versus high-volume centers and found that mortality was double at low-volume hospitals. They also showed that an increased volume to 50 procedures per year resulted in decreased probability of mortality by half. Although the threshold for a high volume hospital was set at 10 procedures per year, 75% of the patients in the entire study had their operation performed at a center with a median case volume of 83 procedures per year, suggesting that the results likely apply to very high volume centers (27). This supports the need to transition to regionalization to high-volume centers or centers of excellence in order to improve outcomes.

As discussed, virtually every study evaluating outcomes relating to morbidity and mortality have shown that high-

volume centers/surgeons have improved outcomes for complex surgery. Part of this is undoubtedly due to the ability to incorporate a multidisciplinary approach when caring for these patients. Specifically in reflux disorders, there has been support for a multidisciplinary approach in the care of these patients, not only to improve clinical outcomes but also patient reported outcomes (28). In order to most effectively care for these patients there needs to be collaboration with internists, gastroenterologists, advanced practitioners, and dieticians. Long-term durability of these surgical repairs not only rely on surgeon specific factors but is likely influenced by patient compliance to lifestyle modifications in the postoperative period.

In summary, hiatal hernia repairs are complex and require both extensive knowledge of foregut physiology, factors contributing to success as well as failure, and significant surgical skill and training in foregut procedures. A surgeon performing these operations should have completed at least 25–50 cases in training or under the supervision of a more experienced mentor and if performing revisional surgery, we would suggest the surgeon to have completed more than 100 cases to ensure optimal comfort with operative technique and experience with complications and their management. Familiarity and expertise with esophageal physiology and preoperative workup is critical in choosing the correct anti-reflux operation for the right patient. Dedication to hiatal hernias and foregut diseases, not only requires expert procedural knowledge, but also a commitment to long-term follow-up. Given that recurrence rates are often as high as 40%, viewing hiatal hernias as a chronic disease would be the appropriate mindset (29). When poorly performed or inappropriately applied, the consequences of these operations to patients can be devastating. This has likely contributed to prejudice against these procedures by the medical community and patients. It is imperative that only surgeons willing to acquire the skill and knowledge described above perform these operations so we as a surgical community can renew faith in operative interventions for not just hiatal hernias but all anti-reflux surgery.

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