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Recent Advances in Minimal Access Surgery-4

Special Edition

Hernia and Abdominal Wall Reconstruction

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CHAPTER 2

Hernia Surgery: Predicting Outcomes

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INTRODUCTION

Though ventral hernia repairs (VHRs) have become one of the most commonly performed surgeries by general surgeons and abdominal wall reconstruction specialists, alike, there is no one right way to repair a ventral hernia.[1,2] Despite the number of procedures carried out, which is approximately 611,000 annually, complications in VHR remain fairly common.[3] It is important for surgeons to ascertain durable and safe techniques.[4] Traditionally, the choice of repair, surgical approach, mesh choice and placement, and technique to close the fascia were left to the surgeon's experience and discretion,[5] but are there tools to help surgeons methodically decide on the best surgical approach?

The ability to predict hernia outcomes begins as early as the preoperative phase with thoughtful exploration of a patients' comorbidities, surgical history, including previous repairs, quality of life, size and location of the hernia, and the associated risks of the procedure. As we move through the preoperative planning, surgeons often rely on more than anecdotal experience or empiricism to counsel patients. Tools exist to predict outcomes and stratify individual patient risk. This chapter provides a guide for understanding and predicting outcomes and shares insights into how these tools can be implemented into an abdominal wall reconstruction practice. We will delve into predicting recurrence, wound complications, and cost in hernia surgery, offering a comprehensive understanding of this aspect of our practice and providing patients with helpful information to make an informed decision about their hernia repair.

PREOPERATIVE OPTIMIZATION AND RISK STRATIFICATION

Preoperative Optimization

Predicting hernia repair outcomes begins at the first preoperative visit. A thorough history and physical examination are required to understand the patients' comorbidities, prior abdominal surgical history, functional status, quality of life, and characteristics of their hernia, as outcomes are dependent not only on surgical technique but also on patient factors. Patients with recurrent hernias, higher body mass index (BMI), uncontrolled diabetes,

smoking, and large hernia defects are at higher risk for recurrence and complications.[6] Often, acknowledging these components helps to determine whether to approach the hernia repair with an open or minimally invasive technique, if the surgery is to be performed at all.

Preoperative optimization in our practice often includes weight loss, smoking cessation for 4 weeks prior to surgery, and improved blood glucose control with a hemoglobin A1c (HbA1c) of <7.2%. These methods of optimization have been shown to decrease wound complications, improve recurrence rates, lower cost, and, ultimately, by impacting their overall health, prolong patients' lifespans. We have extensive data supporting this practice,[7] which we have built into an app to predict outcomes and facilitate shared decision making with the patients.

Carolinas Equation for Determining Associated Risks Application: Predicting Postoperative Wound Complications

There are several adjuncts or risk calculators that can provide patients with estimates of specific outcomes based on their individual risk factors. Our group has pioneered the use of predictive tools for hernia surgery. The Carolinas Equation for Determining Associated Risks (CeDAR) application, which is free and available on the Apple and Android store, is one such innovation that has been downloaded thousands of times in more than 130 countries worldwide[8] **(Fig. 1)**. The CeDAR app calculates the percentage of risk of postoperative complications and the associated cost of wound complications for 1 year after VHR. This digital tool serves as a valuable addition to our armamentarium, assisting both surgeons and patients with decision making around hernia repair. The goal is not just to predict the risk but also to demonstrate the potential impact of improving preoperative variables. Physicians working with patients or patients themselves can enter

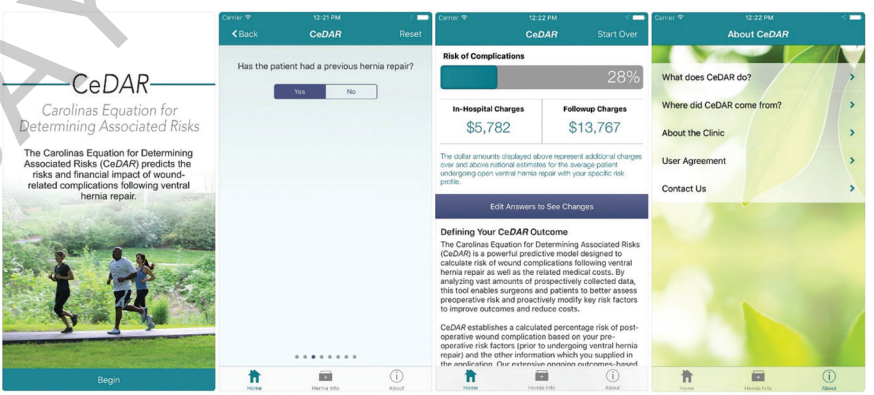

Fig. 1: CeDAR application preview on the Apple or Android store.

their own characteristics such as primary versus recurrent hernia, BMI, tobacco use, HbA1c, and other perioperative elements to calculate a tailored risk estimate.[8] By changing these variables, such as stopping smoking for 4 weeks prior to surgery, losing weight, and achieving an HbA1c of <7.2%, the app can, in real time, demonstrate a decrease in wound-related complications.

The app additionally associates a follow-up and hospital cost with each complication. Patients with a wound infection were found to spend over $20,000 in follow-up cost and $65,000 in hospital cost, compared to patients without complications who spent $1,400 in follow-up and $38,700 in hospital cost. This increase in cost was further exacerbated in patients with mesh infections.[8] The CeDAR app again reflects the change in cost associated with improved preoperative variables and decreased risk of expensive complications. The CeDAR app serves as a predictive tool and a potential motivator for patients' preoperative optimization.

Carolinas Comfort Scale

In abdominal wall reconstruction, postoperative outcomes have become increasingly focused on quality of life. Traditionally in hernia surgery, surgeons have relied on generic quality of life assessments, such as the Short Form-36 (SF-36), as a "gold standard."[9] Our prior work has revealed the limitations of SF-36 when applied to hernia patients, as these surveys do not evaluate symptoms specifically related to hernia repairs, such as chronic pain or the sensation of mesh.[10,11] The need for a disease-specific quality of life questionnaire was justified,[9] so in response to the limitations of generic surveys, we formulated the Carolinas Comfort Scale (CCS).[11]

The CCS is a hernia-specific quality of life questionnaire **(Fig. 2)**. The survey asks about mesh sensation, pain severity, and movement limitation in several daily motions such as bending at the waist, lying down, sitting, coughing, walking upstairs, performing activities of daily living, and exercising.[11] Patients are recommended to undergo the questionnaire preoperatively, as well as 1-month, 6-month, and 1-year postoperatively. The CCS has since been utilized in more than 48 countries, translated into 25 different languages, patented, and was validated by one study that included almost 4,000 patients and nearly 12,000 assessments worldwide through the International Hernia Mesh Registry.[11] Once the data demonstrated that the CCS was a reliable instrument for assessing quality of life after hernia repair with mesh, we aimed to use this data to identify risk factors for chronic pain.

For ventral hernias, our group assessed repairs between 2007 and 2014 and used the CCS to measure patients' quality of life.[10] Multivariable logistic regression analyses were then performed to identify independent predictors of pain at 1-month, 6-month, and 1-year postoperatively. Variables predictive of pain at 1-month included younger age, female sex, presence

Fig. 2: Carolinas Comfort Scale—quality of life assessment.

of preoperative pain, preoperative narcotic use, component separation, and postoperative complications. Of these variables, younger age, female sex, and preoperative pain remained predictive at 1-year postoperatively.[10] Recurrent hernia was an additional predictor of chronic pain at 1-year. As expected, increasing pain scores at the 1-month and 6-month postoperatively were also predictive of chronic pain 1-year after VHR.[10] These predictors were then engineered into a mathematical algorithm to provide an objective, calculated risk assessment. This algorithm, published by Cox et al., helped identify high-risk patients who may need additional interventions, such as a pain management referral, physical therapy, or a tailored pain medication regimen, to improve their potential chronic pain after hernia repair.

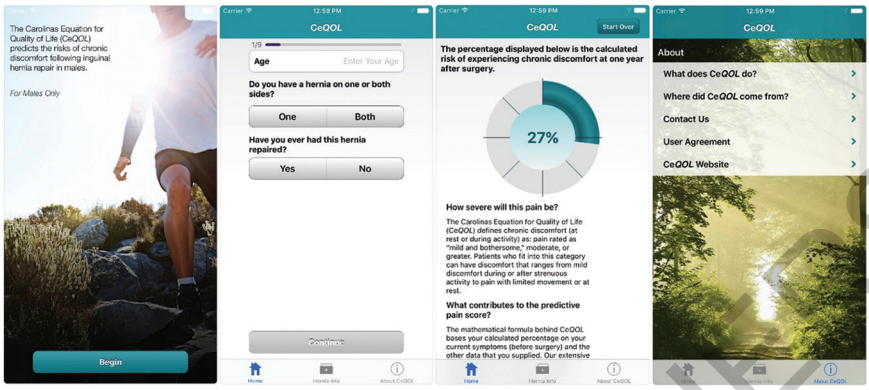

Fig. 3: CeQOL application preview on the Apple or Android store.

Carolinas Equation for Quality of Life Application: Predicting Postoperative Pain after Inguinal Hernia Repair

For inguinal hernia surgery, the CCS data was transformed into a predictive application, the Carolinas Equation for Quality of Life (CeQOL). This interface allows patients to estimate their own risk of chronic discomfort after inguinal hernia repair **(Fig. 3)**. CeQOL poses 19 questions about patient history, hernia characteristics, and current quality of life status. Utilizing previous international data on patients, the mathematical equation calculates the percentage chance of having postoperative discomfort based on an individual patient's specific factors. Those factors, which increased the likelihood of chronic discomfort after surgery, included younger age, level of preoperative pain, activity limitations, previously failed surgery, and bilateral repairs.

Predictive tools, such as the CeQOL, were designed to help predict quality of life, but this application can be utilized when counseling patients on the risk of postoperative pain prior to their repair. Ultimately, this tool has the potential to inform patient expectations, improve satisfaction, and potentially change our perioperative and postoperative pain management.

National Surgical Quality Improvement Program Surgical Risk Calculator

A traditional and widely implemented surgical risk assessment is the National Surgical Quality Improvement Program (NSQIP) calculator that is based from 21 preoperative demographic factors, comorbidities, and procedure details to predict 13 outcomes.[12] The outcomes include serious complications, any complication, pneumonia, cardiac complication, surgical site infection, urinary tract infection, venous thromboembolism, renal failure, readmission, return to the operating room, sepsis, discharge to nursing or rehab facility,

and death. The NSQIP risk assessment is built from an amalgamation of large sums of data, but it lacks detailed descriptions of individualized surgical procedures.[13] It also limits the development of complications to 30 days postoperatively. The risk calculator is particularly helpful in goals of care discussions and informed consent in emergent settings but may carry less predictive value in the specifics of elective VHR, where it underpredicted wound complications by threefold.[14] This may demonstrate the underlying complexity of patients who have developed wound healing failure and, thus, a ventral hernia, or the need to record complications in these patients longer than 30 days, or both.

Balla et al.[15] utilized NSQIP data to demonstrate the effectiveness of a modified frailty index in predicting major complications and discharge to somewhere other than home after open VHR. Patient factors are incorporated into the frailty index: Hypertension requiring medication, diabetes mellitus, chronic obstructive pulmonary disease (COPD) or pneumonia in the last 30 days, functional status, and congestive heart failure. As anticipated, frail patients were more likely to experience complications.[15] Functional status, defined by a spectrum from independent to fully dependent, was the most significant contributor to morbidity, mortality, and discharge location postoperatively. Again, this demonstrates the importance of preoperative optimization to improve outcomes and discharge planning.

Utilizing Computed Tomography Scans in Predicting Surgical Techniques and Outcomes

The ubiquitous use of preoperative imaging in abdominal wall reconstruction affords an excellent opportunity to employ it in predictive algorithms that may be used worldwide. In the general sense, computed tomography (CT) scans aid surgeons in choosing a surgical approach and in predicting the maneuvers required to accomplish a fascial closure. CT imaging provides information on the defect size and hernia contents, prior mesh or component separation, intra-abdominal infection, and organ disease, among other findings. In a formal predictive sense, CT imaging has been used to predict the need for a component separation or the usefulness of preoperative "components relaxation" by botulinum toxin A injection into the oblique musculature.

An early CT-derived equation was the Carbonell calculation, which utilizes the CT-measured rectus width to hernia width ratio. This measurement predicts whether fascial closure can be achieved without additional myofascial release in an open VHR. It is calculated by measuring bilateral rectus muscles at the level of the widest point of hernia defect in the axial view. The addition of right and left rectus lengths is divided by the hernia defect length.[5] A ratio of rectus to hernia defect >2 predicted a 90%

chance that rectus abdominis release (with a retrorectus repair) alone would achieve fascial closure. If the ratio was <1.5, >50% of patients would require an additional component separation technique (CST), and if <1, almost 80% of patients required component separation for successful fascial closure.[5] Unfortunately, the calculation does not take into account the volume of the hernia, which can significantly impact the need to perform a components release regardless of defect size.

The goal of this preoperative calculation is to prepare surgeons for the requirement of a technically more complex hernia repair. If surgeons are not comfortable with myofascial releases, such as a transversus abdominis release or external oblique release, it is important to predict the need for these techniques preoperatively rather than in the operating room to avoid a suboptimal repair. Predicting this need preoperatively also provides an opportunity for patients to be referred to a tertiary hernia center if needed. This mathematical assessment may also aid in the decision as to whether patients would benefit from preoperative abdominal wall botulinum toxin a injections. In our practice, if we suspect a patient will need a component separation, we will request Botox injections of the patients' oblique musculature about 2 weeks before surgery.[16,17] Techniques such as Botox injections and preoperative progressive pneumoperitoneum can help achieve fascial closure,[18] and simple CT imaging can serve as a predictive tool.

Volumetric measurements can also be obtained from preoperative CT imaging and help predict intraoperative and postoperative outcomes.[19] Extra-abdominal volume, which reflects subcutaneous fat, was found to be associated with higher rates of panniculectomy, wound complications, and readmission.[20] As intra-abdominal volume increases, a measure of visceral obesity, intra-abdominal pressure also increases leading to greater incisional hernia occurrence and recurrence after intervention.[20-22] These measurements can help physicians to motivate patients to achieve weight loss prior to surgery.[7] Further, several groups have demonstrated the postoperative risks from preoperative volumetrics. Using CT volumetrics, loss of domain can be calculated by dividing the hernia sac volume by the sum of the hernia volume and intraabdominal content volume, noting that a ratio >20% carries a high risk of surgical complications, including postoperative abdominal compartment syndrome, respiratory failure, and recurrence.[23,24] Loss of domain can justify preoperative strategies such as Botox or progressive pneumoperitoneum to increase the likelihood of fascial closure,[25-27] which, if not achieved, can increase recurrences rates up to sevenfold.[28] Overall, preoperative imaging is useful in abdominal wall reconstruction to predict outcomes, but, in a traditional sense, it only details those at increased risk with little direct information.

Predicting Respiratory Failure

Just as CT volumetrics may be useful in predicting the use of a CST, they have also been shown to predict the risk of respiratory insufficiency or failure after open VHR.[29] A study from our group at Carolinas Medical Center implemented 3D volumetric software to provide calculations of patients' hernia sac volume, intra-abdominal volume, and subcutaneous tissue volume. Just as abdominal compartment syndrome can be a complication of a tight hernia repair, respiratory insufficiency can develop in the same way but is impacted by antecedent lung disease.[30] The newly increased intra-abdominal pressure puts resistance on the diaphragm, requiring more effort to obtain normal lung expansion and making it more difficult for patients to take a deep breath.

The risk of respiratory insufficiency may be recognized intraoperatively by increased plateau pressures and positive end-expiratory pressures shortly after fascial closure, although we find this poorly predictive.[22,30,31] Some have suggested these findings might push surgeons to keep their patients intubated or even paralyzed for a short period postoperatively, but again, we have never done this and find it far from predictive.[29] Risk of respiratory failure was also associated with history of heart failure, intraoperative product transfusion, obstructive sleep apnea, asthma, obesity, and preexisting lung disease.[29,32] In one particular study, the overall incidence of respiratory insufficiency or respiratory failure was 8.3%; however, 19.2% of patients with COPD and 14.9% of patients with asthma ultimately developed some form of respiratory insufficiency.[29] The hernia defect properties predisposed patients to the need for continuous positive airway pressure, bilevel positive airway pressure, or reintubation. Larger defects, specifically >250 cm^2 and a hernia to intra-abdominal volume ratio >50%, were at the highest risk for respiratory insufficiency, given the marked loss of domain.[29] Though BMI does impact hernia parameters,[21] it was not an independent predictor of respiratory insufficiency alone.

These findings allow providers to take preoperative measures, such as chemical denervation or progressive pneumoperitoneum, to possibly facilitate prevention of respiratory insufficiency and failure. Intraoperatively, this may be in the form of a component separation, and postoperatively, this may include intensive care unit monitoring or prolonged ventilation.

PERIOPERATIVE FACTORS AND DECISION MAKING

Hernia Location and Wound Classification

The most commonly utilized hernia classification system was developed by the European Hernia Society (EHS) in 2009 and was based primarily on hernia location and size. Hernias were divided into midline or lateral categories. Midline hernias were divided into zones: Subxiphoidal (M1), epigastric (M2),

umbilical (M3), infraumbilical (M4), and suprapubic (M5) defects. Lateral hernias were subdivided into subcostal (L1), flank (L2), iliac (L3), or lumbar (L4) defects. Hernias were also described by the greatest measurement of the defect, whether length or width. Small hernias were <4 cm in diameter (W1), moderately sized hernias were between 4 and 10 cm in diameter (W2), and large defects measured >10 cm in diameter (W3). The final parameter grouped hernias based on the number of prior repairs.[33] Baucom et al.[34] sought to determine whether the EHS classification system was associated with different wound outcomes. Defects with both midline and lateral components were 4.6 times more likely to endure a wound complication compared to those with a midline defect only.[34] Patients were also more likely to develop a wound complication if their midline defect spanned more than one zone. As defect size increased, so did the risk of wound occurrence. W3 hernia repairs were associated with wound occurrence rates as high as 52%.[34] With the data generated in this study, the EHS classification system can be utilized as a preoperative tool to predict the risk of wound complications and surgical complexity.

The Ventral Hernia Working Group (VHWG) is another grading system that incorporates patients' comorbidities and histories rather than hernia characteristics. The VHWG classification system stratifies patients based on their risk of developing a surgical site occurrence.[13] Grade 1 was the lowest risk group and was made up of patients with no history of wound infections. Grade 2 was a comorbid group that included patients who smoked, had COPD, were obese, had diabetes, or were immunosuppressed. Grade 3 was made up of patients with potential or controlled contamination, for example a prior wound infection, stoma, or intraoperative violation of the gastrointestinal tract. Lastly, Grade 4 was the group with a known infected mesh or septic wound dehiscence.[13] In its original publication, this classification system predicted the risk of wound complications, and thus had the potential to guide decisions such as biologic versus synthetic mesh placement. Grade 1 carried a risk of surgical site occurrence of approximately 14%, thus synthetic mesh was recommended. Grade 2 was more debated, so mesh choice was left to the discretion of the operating surgeon. Grades 3 and 4 had a risk of wound complications ranging from 40 to 70%, so a biologic mesh was recommended.[35] Though the VHWG categorization did not incorporate hernia characteristics, it has been shown that a higher grade predicts a greater likelihood of surgical site occurrence.[13]

Minimally Invasive versus Open Ventral Hernia Repair

The choice in surgical approach usually occurs preoperatively, but there are perceived outcomes associated with each technique. In a prospective quality of life comparison between open and laparoscopic VHR, Colavita

et al.[36] found that patients initially had more discomfort with a standard laparoscopic repair, but the pain of these procedures, as measured by the CCS, was not different between groups at 1-year postoperatively. The minimally invasive approach was associated with decreased infection rates and shorter length of stay, which has been demonstrated in other studies as well.[36-39] Though, overall complication rates and recurrence rates were similar between techniques,[36] a higher recurrence rate has been shown in cases that were converted from laparoscopic to open.[37] Acknowledging these differences and similarities aid in patient discussions on which technique should be employed in their hernia repair.

Further, Schlosser et al.[6] investigated the optimal surgical approach to VHR by developing an algorithm utilizing an expansive, tertiary referral center database. This study found that small to medium defect sizes had fewer postoperative complications when repaired laparoscopically, but this benefit in outcome was mitigated in large defects. Additionally, these predictive models suggested that an open approach be more heavily considered for obese patients with large defects, because the risk of recurrence was higher for obese patients with laparoscopic repairs.[6] While no algorithms exist to demonstrate that patients who smoke, have poor diabetic control, and require surgery more urgently should undergo laparoscopic or robotic surgery, it is reasonably accepted that the minimally invasive approach will reduce wound complications while not negatively impacting recurrence.

Elective versus Emergent Hernia Repair

Though the majority of our practice revolves around elective VHRs, there are scenarios of emergent or urgent hernia repairs. Incarcerated abdominal wall hernias can present with obstruction, strangulation, perforation, or gangrene and are surgical emergencies for the acute care surgeon. The decision to operate emergently is based on a patient's preoperative examination, laboratory work, imaging, and threatened bowel, which can be best assessed intraoperatively.[40] Because of the concern for bowel viability, emergent repair has traditionally been performed in an open fashion, and it is still the most common technique employed, but emergent repairs are being increasingly accomplished laparoscopically.[41]

The priority of an emergent repair is to relieve the bowel obstruction or salvage viable bowel, rather than perform a definitive hernia repair. Given the lack of preoperative optimization, the presence of systemic illness, and the possibility of contamination, among other issues, emergent incisional hernia repairs have higher mortality and recurrence rates than elective repairs. African American and Hispanic patients have higher rates of emergent VHR compared to White patients.[42] Older age, greater BMI, presence of ascites, and smaller hernia neck size have been shown to be risk factors for

incarceration and death after emergent repair.[40,42-44] The risk of complications is higher, and only increases if bowel resection is required, so a mesh repair is not often performed.[40] Whittaker et al.[45] reported that less than half of urgent or emergent repairs are mesh-based repairs with a threefold increase in recurrence.

Though there is no comprehensive set of risk factors that predict acute bowel incarceration, surgeons often have tailored discussions with patients regarding the specific characteristics that make them prone to incarceration. As part of the informed consent process, surgeons may report on the risk of nonoperative management. An important but poorly defined part of this discussion is the estimated risk of incarceration requiring emergent surgery if a hernia is not repaired electively. Dadashzadeh et al.[44] predicted that the 5-year incidence of incarceration in nonoperative management of incisional hernias was 2.59%. Though the risk is low, emergent repair can carry significant consequences. Counseling can be performed in the outpatient setting when planning on an elective repair and prioritizing preoperative comorbidity optimization. But this data also allows surgeons to generally predict outcomes when counseling patients and families in the emergent setting.

Intraoperative Contamination

The presence of intraoperative contamination or infected foreign bodies forces surgeons to make practice-changing decisions at the time of surgery, knowing that those patients have a higher risk of postoperative wound and infectious complications.[46,47] Surgeons may choose to place a biologic or synthetic absorbable mesh rather than permanent synthetic mesh or consider performing a primary repair without mesh altogether.[48-51] In our practice, we utilize biologic or absorbable mesh, as listed in the studies referenced, in a single-stage method.[46] We very often combine this with a delayed primary closure of the skin and subcutaneous tissues, which is most often performed 4–6 days postoperatively. This has shown to significantly reduce wound-related complications.[52] If the risk of infection is believed to be too great at the original surgery, a two-stage repair can be performed. Kugler et al.[53] described the first operation where source control was achieved, mesh was excised, and enterocutaneous fistulas were taken down. No mesh was placed at that time, and the patient was kept on intravenous antibiotics for a few days prior to returning to the operating room during the same admission for the second procedure with definitive mesh repair.[53] However, a more delayed operation, where one waits several months after the primary operation before a definitive repair is performed, is more commonly described.[54] In this case, we would usually wait until the hernia recurs before moving forward with another operation, given that not all contaminated hernias recur even if

primarily closed. It should also be noted that patients who have an operation involving a mesh infection or fistula may not opt for any surgery despite suffering a recurrent hernia.

In patients with a known history of wound infection or active mesh infection, abdominal wall surgeons can discuss the drawbacks and advantages of a single or staged repair. If contamination is realized intraoperatively, surgeons must weigh the risks and benefits of a definitive repair at that time. Understanding the data on outcomes in contaminated cases allows surgeons to create a tailored approach and counsel patients on their predicted outcomes.

ARTIFICIAL INTELLIGENCE AND PREDICTIVE MODELS

While a number of medical disciplines have explored the use of artificial intelligence (AI),[55] the same is true in abdominal wall reconstruction. AI has the promise of providing predictive tools and other technologies that enhance preoperative planning, intraoperative precision, and post-operative care. Machine learning algorithms analyze vast datasets, aiding in the identification of patient-specific risk factors and optimizing surgical strategies.

Our tertiary hernia center has been on the forefront of implementing AI in abdominal wall reconstruction with the potential to incorporate it into our daily practice. The first study applying AI to abdominal wall reconstruction utilized preoperative CT scan image-based deep learning models (DLMs) to predict surgical complexity and complications.[56] In this study, we defined complexity as those operations which required CST for abdominal wall closure. This AI study also sought to predict patients who would suffer pulmonary or wound complications after surgery. CT images from almost 400 patients were analyzed by the DLM. The model quite accurately predicted which patients would need a CST. In the next phase of the study, the DLM was pitted against six expert abdominal wall reconstruction surgeons who reviewed the same preoperative CT images. AI more accurately predicted whether a patient would require a CST by a margin of 81.3% compared to 65.0% by the surgeons.[56] The DLM was very successful at identifying patients who would develop a surgical site infection postoperatively but was less accurate when predicting pulmonary failure. These results suggest that a DLM's ability to predict surgical complexity or complications may help delineate which patients should have their hernia repairs performed at a community hospital versus a tertiary referral hernia center.[56] These data might also contribute to a surgeon's ability to more thoroughly consent a patient prior to surgery.

We have also demonstrated the ability of AI to predict rare outcomes after open VHR. Our second study on AI developed novel algorithms to build upon the earlier DLM outcome prediction. Similarly, two image-based DLMs were

IAGES Recent Advances in Minimal Access Surgery-4

Following the resounding success of "IAGES Recent Advances in Minimal Access Surgery, Vol. 4," which heralded the integration of robotic technology in modern surgical practices, we are thrilled to present a new manual and special edition devoted exclusively to Hernia and Abdominal Wall Reconstruction (AWR). This volume is crafted to be an indispensable resource for surgeons, clinicians, and medical professionals who are committed to staying at the forefront of hernia and AWR surgical advancements. Through rigorous research, expert contributions, and a focus on cutting-edge technology, this book aspires to elevate surgical practice and propel the ongoing evolution of medical science.

Over the past three decades, the realm of Hernia repair and AWR has undergone a transformative revolution into surgical techniques and approaches. These advancements have resulted in improved patient's outcomes, shortened recovery periods, and elevated standards of care. This volume aims to encapsulate the vast scope of these advancements, providing a thorough overview of the latest innovations and techniques in hernia surgery and AWR. It is designed to be a vital update for readers, ensuring they remain informed about the recent developments in this specialized field.

Subhash Khanna MS FRCS Edin FIAGES FALS FAGIE presides as the Head of the Department of Minimal Access, Gastrointestinal and Robotic Surgery at Swagat Superspeciality Surgical Institute and serves as the Dean of Swagat Academy of Medical Sciences in Guwahati, Assam, India. Additionally, he is an Honorary Visiting Professor at the Department of Gastrointestinal Surgery, GSL Medical College, Rajahmundry, Andhra Pradesh. An internationally renowned surgeon with a fervent dedication to Minimal Access, Gastrointestinal and Robotic Surgery, Dr Khanna has made significant contributions to the development of this specialty both in India and across the globe. His leadership encompasses the distinguished positions of former President and current Chief Trustee of the Indian Association of Gastrointestinal Endo-Surgeons (IAGES), while concurrently serving as a catalyst in the establishment of the Association of Robotic and Innovative Surgeons as founding presidents.

He has also been entrusted with the distinguished position of Congress President for the World Congress of Endoscopic Surgery (WCES—IAGES 2024) to be held in Kolkata, India.

He has authored numerous chapters and serves as President, Chief Editor, and Board Member on the Editorial Boards of various esteemed journals and books. He has co-edited the IAGES textbook "Comprehensive Laparoscopic Surgery."

Printed in India

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ISBN 978-93-5696-817-2
9 789356 968172