



Research Paper

Spigelian hernias: A high volume institutional review

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ABSTRACT

Purpose: The objective of this study was to evaluate a high-volume hernia center's experience with primary Spigelian hernias.**Introduction:** Spigelian hernias are rare entities presenting a diagnostic dilemma for clinicians that often lead to a delay in treatment or need for emergency surgery. Given this low incidence true patient and hernia characteristics are unknown.**Methods:** This was a retrospective chart review evaluating patients who underwent a Spigelian hernia repair between 2005 and 2019. Descriptive statistics were utilized.**Results:** The incidence of Spigelian hernias at our institution was 0.14 %. There were 141 patients with 143 spigelian hernias (two patients had bilateral hernias) repaired at our institution during the study period, the majority of these were in male patients, left sided and repaired under conscious sedation with or without the use of mesh.**Conclusion:** This study adds a large dataset to the paucity of literature that exists in the context of Spigelian hernias and alerts the clinician that these hernias are not exclusive to the older female population. Furthermore, this study provides the need for a high index of suspicion in patients presenting with vague abdominal pain who may not fit the typical Spigelian hernia mold.© 2023 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Spigelian hernias are defined as those that protrude through the linea semilunaris, usually below the arcuate line in an area often referred to as the Spigelian belt [1]. These hernias can be either congenital or more commonly acquired and multiple risk factors have been identified: previous surgery (open or laparoscopic), collagen disorders, age and increases in intraabdominal pressure [2–5]. The incidence of such hernias varies depending on the literature from 0.1 to 2 % [6–8].

Given this low incidence, they often present a diagnostic dilemma for the clinician and frequently lead to a delay in treatment or the need for emergent surgery [4,9]. As well given their relatively rare nature, true patient and hernia characteristics are unknown – including patient demographics and co-morbidities, as are optimal treatment approaches [1,9–13].

Studies completed to date have been case reports and small case series, with a single small Randomized Control Trial (RCT) encompassing 22 patients and a larger more recent cases series – focusing solely on operative techniques [6,11–13]. Furthermore, the European Hernia Society

(EHS) and American Hernia Society (AHS) have published a position paper as to the preferred treatment approaches, acknowledging a lack of data to suggest such a recommendation [1]. Given this, more robust data is needed to make informed decisions in the operative setting as well as understanding characteristics both patient and hernia related that may have an impact on post-operative care and outcomes.

Therefore, the objective of this study was to evaluate our high-volume centers' experience with primary Spigelian hernias, aiming to further characterize this population.

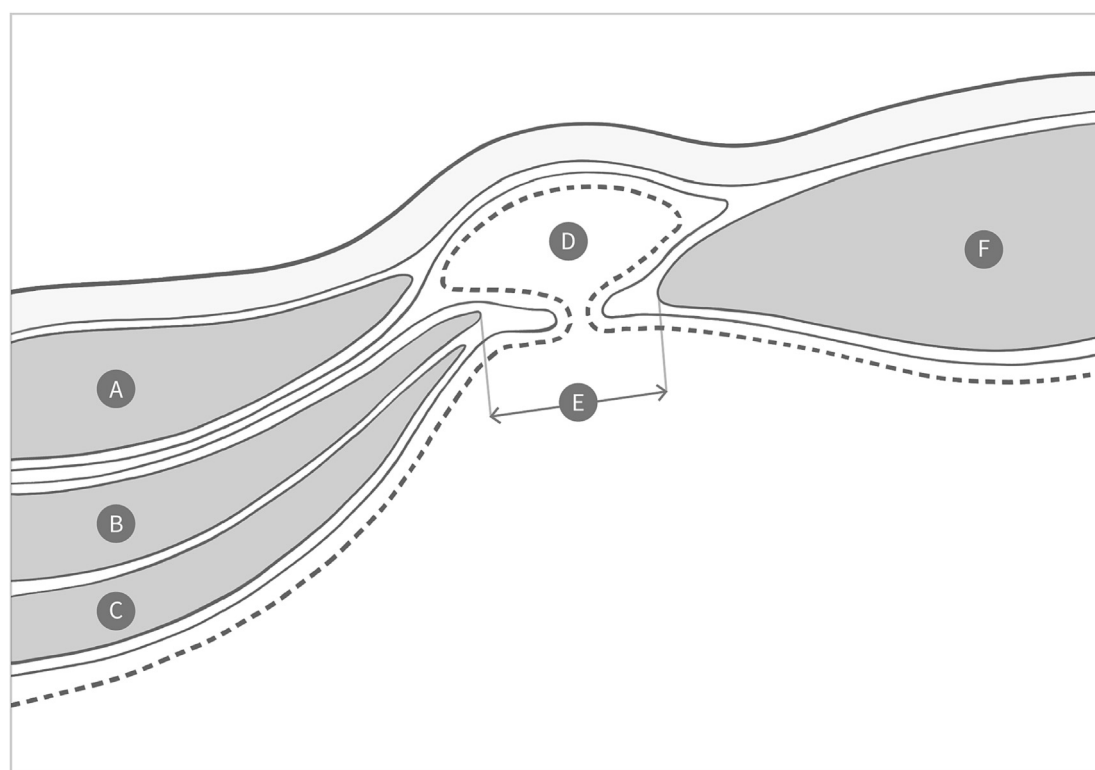
Methods

Ethics. The research ethics board at an associated institution approved this study (Lakeridge Health Research Ethics Board).

Definitions. Spigelian hernias (Fig. 1) are defined as those that protrude through a defect in the Spigelian aponeurosis, which itself is the transversus abdominis muscle aponeurosis – bounded laterally by the linea semilunaris and medially by the lateral edge of the rectus abdominis muscle [1]. They occur within the Spigelian belt, a six-centimeter area above the anterior superior iliac spine (ASIS) cephalad towards the umbilicus. This area includes the arcuate line, the level at which most of these hernias occur [1].

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- A** External oblique
- B** Internal oblique
- C** Transverse abdominis
- D** Hernia sac with contents
- E** Spigelian fascia
- F** Rectus abdominis

Fig. 1. Rendering of a Spigelian hernia through the various tissue layers. This specific diagram depicts the most common Spigelian hernia variant in our study the interstitial type.

Spigelian hernias can be further classified into the interstitial subtype (Fig. 2) where the hernia sac is below the external oblique or the subcutaneous subtype where the hernia sac is protruding through the external oblique. Size estimations in the study were based on EHS consensus guidelines [14].

Study design. This was a retrospective chart review evaluating patients who underwent a Spigelian hernia repair at a high-volume hernia center between 2005 and 2019. Inclusion criteria were as follows: Patients ≥ 18 years of age undergoing a primary hernia repair. Exclusion criteria were as follows: Patients ≤ 18 years of age, those undergoing surgery for a recurrent hernia or a hernia where the exact location (i.e., Spigelian versus ventral versus inguinal) could not be determined.

Data collection and analysis. This study initially utilized a search of the hospital database evaluating all patients who met the inclusion criteria. These patient charts (clinic notes, operative reports) in either electronic and/or paper form were evaluated by the hospital research associate (MM) and one of two surgeons (either PS or FSN) to collect information on method of repair (with or without mesh), hernia recurrence rates, hernia characteristics, patient demographics, previous hernia history,

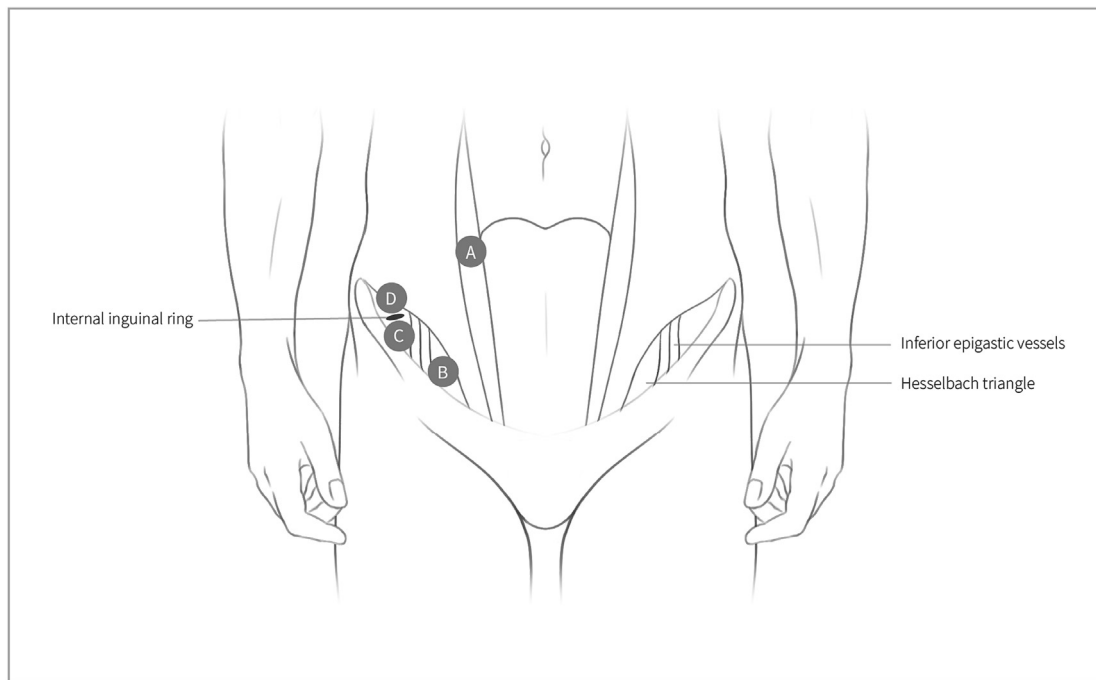
time to surgery and short-term morbidity (30-day) between 2005 and 2019. In instances where questions arose or clarification was needed a discussion and consensus was utilized for inclusion in the study between the three authors.

Descriptive statistics were utilized to depict both patient and hernia characteristics and methods of repair. The data is presented as median (interquartile range (IQR)) unless otherwise specified.

Statistical analysis. Statistical analyses were calculated using Microsoft Excel version 2019 (Microsoft Corporation, Redmond, Washington).

Results

Within our study, Spigelian hernias were more common in men versus women (Table 1). The median age for men was 67 years old and slightly younger in females at 62 years old. Fourteen patients were actively smoking at the time of their surgery, while 22 patients quit peri-operatively. Although some data were lacking regarding exact number of pregnancies, where present the majority of female patients had a median of two pregnancies. Interestingly only 4 patients had a diagnosed connective tissue disorder.



- A Spigelian hernia
- B Direct inguinal hernia
- C Indirect inguinal hernia
- D Interstitial hernia

Fig. 2. Rendering of a Spigelian hernia (A) in relation to various groin hernias, including the briefly discussed interstitial groin hernia (D).

Overall, there were 141 patients with 143 Spigelian hernias (two patients had bilateral hernias) repaired at our institution during the study period (Table 2). Ninety-four were on the left side and 49 on the right side. Overall the incidence of Spigelian hernias at our institution was 0.139% (143 of the 102,425 total hernias repaired during the study period). The majority (138) were of the interstitial type (below the external oblique) (Fig. 3). Their sizes based on the EHS guidelines [14] are outlined in Table 2 as are their location within the Spigelian belt [1]. Specifically, 116 were in the traditional Spigelian aponeurosis and 27 were lateral and/or inferior to the Spigelian aponeurosis but still within the Spigelian belt or described as medial to the anterior superior iliac spine (ASIS) within the Spigelian belt.

One hundred and thirty were repaired using a tissue approach while 13 required the use of a mesh. The median size of hernias requiring a mesh was 4 cm [4, 1–8], while the median size of hernias repaired without a mesh was 2.5 cm [1, 1–8]. Overall, 116 were completed under local anesthetic with a median size of 2.5 cm [1.5, 1–8], while 27 were done

under a general anesthetic with a median size of 3 cm [1, 1.5–8]. Those cases completed under local which were repaired without a mesh (107) had a median size of 2.5 [1, 1–8], while those completed under local using mesh (9) had a median size of 5.25 cm [1, 1.5–8]. Cases done under a general anesthetic without (23) and with mesh (4) had a median size of 3 cm [0.5 cm, 1.5–8] and 3.5 cm [0.75, 2–3.5],

Table 1 Patient demographics.

	Male	Female
Total cases ^a	86	55
Median age (years) [IQR, range]	67 [15, 33–87]	62 [13, 36–88]
Median body mass index (BMI) [IQR, range]	26.12 [2.6, 20.5–33.1]	24.69 [2.8, 19.4–30.9]
Current smokers	9	5
Connective tissue disorders	1	3

^a Two female patients had bilateral hernias, so 141 patients accounted for 143 hernias.

Table 2 Hernia characteristics.

	Distribution
Total Hernias	143
Left side	94
Right side	49
Type of repair	
Tissue	130
Mesh	13
Median operative time (minutes) [IQR, range]	61.5 [19.5, 20–148]
Size ^a	
Small	46
Medium	71
Large	24
Position ^b	
Interstitial	138
Subcutaneous	5
Location ^c	
Between	116
Lateral	27

^a No data was provided on size in two instances.

^b Location in relation to the External Oblique.

^c Location in relation to the Spigelian Aponeurosis.

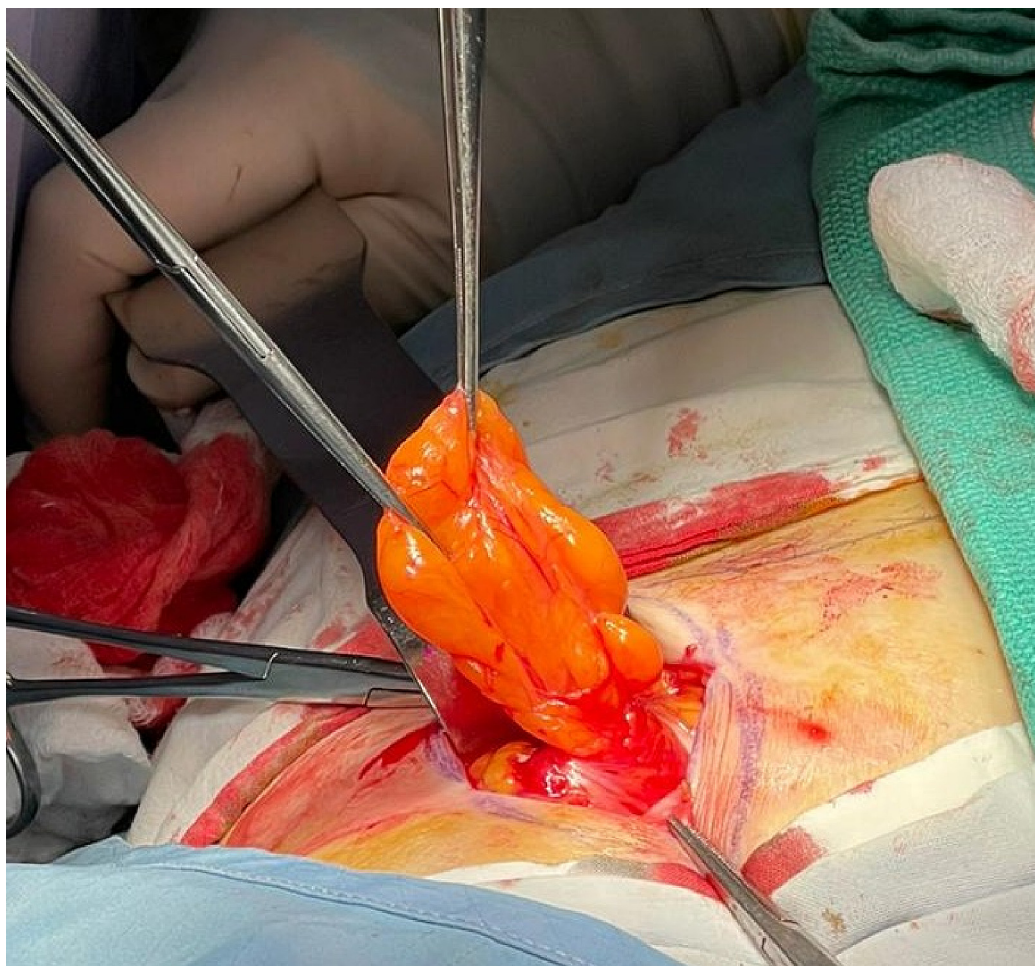


Fig. 3. Depiction of an interstitial type of Spigelian hernia protruding through the external oblique which has been incised and opened.

respectively. The median operative time for all surgeries was 61.5 min [19.5, 20–148].

Table 3 depicts the hernia history of patients undergoing a Spigelian repair. Twenty-eight of the 141 patients concurrently had a total of 30 hernias at the time of their Spigelian hernia diagnosis. Fifty-three of the 141 patients had a history of 83 previous hernia repairs. The most common for both of these categories are outlined in Table 3. Finally, 50 of the 141 patients in the past had undergone an abdominal operation, most commonly in an open manner.

The median time from noting a hernia to undergoing surgery was 111 weeks (79 weeks), while the wait time from initial contact with the surgical system to undergoing surgery was 134 days (108 days).

Discussion

This study presented a 14-year retrospective review of Spigelian hernias at a high-volume center. This is one of the largest collections of such hernias published to date and provides relevant information regarding patient demographics, hernia history, as well as hernia characteristics. This information contributes to the overall knowledge and more importantly ultimate management of these entities.

At this center which focuses solely on hernias, the overall incidence of Spigelian hernias was 0.139 %. This is on the lower end of previously published results [7,13]. Two of the more common explanations for this include a possible misattribution previously of all lateral ventral hernias as true Spigelian hernias and, given our study focused on scheduled rather than emergent hernia repairs we have undoubtedly omitted a

Table 3
Other associated hernia characteristics in patients undergoing a Spigelian hernia repair.

	Total
Concurrent hernias	
Patients	28
Hernias	30
Left inguinal	14
Right inguinal	5
Contralateral spigelian	2
Umbilical	8
Epigastric	1
Previous hernia operation	
Patients	53
Hernia operations	87
Left inguinal	38
Right inguinal	29
Left femoral	2
Umbilical	7
Incisional	4
Interstitial	3
Epigastric	3
Spigelian	1
Previous abdominal surgery ^a	
Patients	50
Surgery	65
Open	40
Laparoscopic	24
Drain placement	1

^a There was no data in 19 individuals regarding previous abdominal surgery.

subset of patients who presented in an emergent manner. Within our center, there has been an emerging entity that we describe as interstitial groin hernias and we are in the process of publishing our findings. These are hernias which are commonly found superior and lateral to the internal ring separated by a muscular bridge of tissue from indirect hernia sacs, themselves true hernias. In this yet unpublished study, we found approximately 200 such hernias both primary and recurrent over a similar time span of this current study (Unpublished data). The exclusion of these interstitial groin hernias in our center and thus study then does not incorrectly confound the true incidence of Spigelian hernias (even as it did historically in our own institution, as these were previously mislabelled as Spigelian hernias). Furthermore, we were quite prudent to not misattribute any lateral hernias in the context of old incisions (i.e. appendectomy, Pfannenstiel c-sections, port sites from laparoscopic surgery, previous abdominal drain sites) as Spigelian hernias, rather they are classified as lateral ventral hernias, which too avoids confounding our overall incidence rate. In terms of excluding a subset of patients that present in an emergent manner, a study completed by Weber et al. documented that approximately 18 % of Spigelian presentations in their subset of patients were in an emergent setting. [13] Similarly, in a smaller study by Polistina et al. found a 27 % emergent presentation. [11] Extrapolating this information, the true incidence (of both scheduled and emergent) Spigelian hernias could be 20–25 % higher than documented in our study, but overall still a relatively rare entity.

The majority of hernias identified in our patient population were of the interstitial subtype. This has anecdotally been suggested in the past, but to date no clear evidence in this regard has been noted [15,16]. This hernia characteristic information adds evidence to the ongoing discussion and at times difficulty in diagnosis, as few seem to be subcutaneous hernias through all of the muscle layers. If a hernia cannot be palpated on physical examination in a patient with lower abdominal pain, imaging to assess the area is imperative as is subsequent discussion with a radiology colleague should there be non-obvious findings to suggest a hernia. Similar to the paper by Webber et al., who classified Spigelian hernias into three stages in terms of size and hernia contents, they felt that, specifically in the younger patient population, those containing pre-peritoneal fat and not protruding through the external oblique were most common and presented both diagnostic and therapeutic challenges. Thus, the understanding and need for a high index of suspicion can guide patient diagnosis and treatment.

Our demographics with a median age in men and women of 67 and 62 years respectively, are in a similar range to more recently published studies [7,11,13] although younger than perhaps originally believed. One very important point brought to light in this study is the range of ages, with the youngest patients in both gender groups being in their thirties, and with an IQR in this study situated in the mid-teens. Suggesting that this is a disease entity not only of the old and frail population, but one that is potentially much younger, thus increasing evidence against an age bias when evaluating patients with vague lower abdominal pain.

There has been debate as to the laterality of Spigelian hernias in the past [7,17–19] with more recent studies suggesting a slight predominance for left sidedness [13,17–20]. Ninety four of our Spigelian hernias were on the left, while 49 were on the right. Although previous studies as mentioned above have made this distinction, our almost 2:1 ratio is the largest disparity noted to date, again helping provide diagnostic clues to clinicians when evaluating patients with vague symptoms. Work has suggested that left sided predominance is more common for congenital rather than acquired hernias [21]. Perhaps one explanation given our younger age range and more predominant left sided laterality is that a larger, although unknown portion of this study population, had congenital defects that were either missed, misdiagnosed, or did not become apparent until later into their adult years.

The gender breakdown suggested that within our patient population, Spigelian hernias were more prevalent in males than females (86

versus 55). This is something not previously reported in the literature. Most studies have documented a female predominance in terms of Spigelian hernia incidence [7,11,13,20] with a few suggesting similar incidence rates based on gender [17,22]. Possible explanations for this discordance in our data could include the focus in this study on scheduled rather than emergent presentations and the potential for more females to present in an emergent manner, however although a paucity of evidence exists on the gender incidence of emergent presentations, Larson et al., found the gender distribution to be equal in their patients who presented in an emergent manner [17]. An alternative explanation could be that males were more likely to be symptomatic than females thus seeking medical care, investigations, and ultimately surgery at our center. Finally, given our caution to exclude other lateral ventral hernias as possible Spigelian hernias, this could also account for our lower incidence of true Spigelian hernias in the female gender given their overall increased lifetime prevalence of undergoing abdominal operations in general [23]. Regardless this is an area requiring further study and should alert the clinician that it may not be a disease process predominantly affecting females. Interestingly, the two patients who had bilateral Spigelian hernias were female.

The biggest identified risk factor for the development of a Spigelian hernia in this study was previous surgical intervention (either previous hernia repair or other abdominal surgery) [2,20,24]. This has been discussed in the past as a factor, where Malazgirt et al., found one third of their study patients had a previous surgery [20]. Although our numbers are more striking with a majority of patients having undergone a surgical intervention, bringing this as a risk factor to the foreground. Reasons for previous surgery increasing the risk of these hernias includes the possible disruption and/or weakening of the muscular architecture of the abdominal wall from previous open surgery, while the use of pneumoperitoneum as disrupting the Spigelian aponeurosis has also been described [15,25]. Connective tissue diagnoses were relatively rare in the included population with only four such instances. Increases in abdominal pressure as a risk factor were identified in female patients, where data was present with a median of two pregnancies per patient, while obesity played a limited role with the median BMI hovering around 25.

Although not the primary focus of this manuscript, within our study, all hernias were repaired in an open manner and the majority of hernias were repaired without the use of a mesh, while a subset were repaired using mesh. Overall, larger hernia defects were repaired with the use of mesh with a median size of 4 cm compared to 2.5 cm for those repaired in a tissue manner. In the instance of mesh use a polypropylene patch was utilized and typically placed either in the pre-peritoneal space or between the internal and external oblique muscles. As per the EHS and AHS position paper data are limited on the preferred method of repair in terms of modality, both open and laparoscopic approaches are seen as appropriate [1]. Laparoscopy has an advantage in instances where a protrusion cannot be clinically noted [1], although care and a high index of suspicion should be taken in instances where as per Webber et al., a Stage I Spigelian Hernia is found – where the contents are pre-peritoneal fat with no peritoneal involvement as these may not be seen laparoscopically and have the potential to be missed [13]. In these instances, we suggest a pre-peritoneal dissection be undertaken in order not to miss such hernias. Furthermore, as per the EHS and AHS position paper Spigelian hernias should be considered for mesh repair although the quality of evidence and strength of recommendation are low/ weak [1]. It is our opinion that either a laparoscopic repair with mesh or an open repair with the intra-operative assessment of the need for mesh based on both patient and hernia characteristics should be the procedure of choice based on the surgeon's comfort level and experience. Furthermore, like the EHS and AHS umbilical and epigastric hernia guidelines suggest, small hernias (<1 cm) and/or those that are larger – in a shared decision-making discussion with the patient can be repaired without the use of a mesh [26]. Our results would suggest this to be a reasonable option. We caution about avoiding

mesh when needed with presumably larger defects and based on intra-operative findings that would suggest a higher recurrence risk.

Finally, based on our study results it is reasonable to consider the repair of such hernias under a local anesthetic based on surgeon and institutional comfort as well. The majority of our surgeries were performed in this manner, regardless of hernia size and use of mesh. This is particularly an attractive option in the comorbid, aging population who themselves are more predisposed to Spigelian hernias [7] and who may be poor candidates for a general anesthetic. These are individuals who may have multiple presentations and admissions through the Emergency Department given these comorbidities and reluctance to operate, rather than proceeding with surgery under conscious sedation once the patient is optimized with potentially improved surgical and quality of life outcomes. This is further supported by the relatively short median operative time of 61.5 min (regardless of anesthetic use) in instances where the duration of an operation can be seen as prohibitive in comorbid and poor operative candidates.

There are a few limitations within our study. First, this was a single institution's experience and the results may be less generalizable to other centers. This is mitigated by the duration of the chart review (2005–2019) and the use of several surgeons over this time period. Furthermore, the goal of this study was to collect demographic information and hernia characteristics in order to increase clinician's knowledge, index of suspicion, and ultimate comfort in the management of these rare entities. Secondly, as a center of excellence focusing only on hernias there could be a selection bias of patients presenting to us with more rare or previously identified hernias on imaging that are asymptomatic and seeking care compared to a general hospital. Interestingly this was not borne out in our results with an incidence rate on the lower end of what has previously been noted [7,13]. Finally, as we provide care for a large population of patients some regionally distant to our institution, loss to follow up does occur as does the loss over time given the study time period. This loss to follow-up however, is not unique to our study but an inherent shortcoming of all retrospective reviews.

Conclusion

This study adds a large dataset to the paucity of literature that exists in the context of Spigelian hernias. Specifically, it alerts the clinician regardless of patient setting that although rare, Spigelian hernias are not only a disease of older female patients, with the biggest associated factor in our patient population for hernia formation being previous surgery, either open or laparoscopic. The majority of hernias were found to be of the interstitial subtype and thus often difficult to diagnose clinically - suggesting that when evaluating groups of patients who in the past may have not been seen to fit the Spigelian hernia mold, a high index of suspicion should be maintained in light of this new information. Furthermore, we provide information about hernia characteristics and repair techniques. Both from an anesthetic standpoint suggesting conscious sedation as an appropriate method particularly in the prohibitive operative group of patients as a reasonable strategy and on the potential need for mesh based on defect size which together can improve the outcomes and quality of life in patients that suffer from them.

Consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and material

Not applicable.

Code availability

Not applicable.

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Ethics approval

This study was approved by the Lakeridge Health Research Ethics Board (2020–009) and complies with institutional/national ethical standards.

CRediT authorship contribution statement

All authors contributed to the study conception and design. Material preparation, data collection and analysis were completed by Marguerite Mainprize, Fernando AC Spencer Netto, and Peter Szasz. The first draft of the manuscript was written by Peter Szasz and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript. We would like to thank Amy Zhu a student in the University of Toronto Master of Science Biomedical Communications degree for her artist renderings of Figs. 1 and 2.

Declaration of competing interest

Mainprize M, Spencer Netto FAC, and Szasz P declare that they have no conflict of interest.

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