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REVIEW

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An updated traditional classification of inguinal hernias

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Abstract The traditional classification of inguinal hernias is the most widely used system today; however, it does not categorize all inguinal hernias nor their levels of complexity. The named systems of Gilbert, Nyhus, and Schumpelick are reviewed, and their common features are analyzed. A simple updating of the traditional classification along with the use of common modifiers creates a system that is all-inclusive and easy to use for data registries. The traditional classification of inguinal hernias (indirect, direct, and femoral) has withstood the test of time for almost 150 years. In this interval, inguinal hernia repairs have experienced significant evolution from simple ligation of the sac or suturing of the muscular defect to improved primary tissue repairs (e.g., Bassini, McVay, Shouldice) based upon better anatomic principles. Also during the past 30 years, two major revolutions in operative repairs have occurred. First, there is the use of mesh and, second, its placement laparoscopically. As a consequence, hernia surgeons today must choose among multiple competing operative techniques. No one operative technique has proven to be best for all inguinal hernias. Also different levels of complexity and severity exist among inguinal hernias, and thus it is essential that we accurately classify the various inguinal hernias, such that we surgeons can provide the best operative solution for each patient. As Fitzgibbons [1] states, ''The primary purpose of a classification for any disease is to stratify for severity so that reasonable comparisons can be made between various treatment strategies.''

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Evolution of classifications

Earlier reviews by Read [2] and by Rutkow and Robbins [3, 4] have summarized the origins and development of the traditional classification of inguinal hernias as indirect, direct, and femoral. This system slowly evolved over 100 years, as surgeons, principally in Europe and Great Britain, created the classic primary tissue repairs in the late 1800s. A second wave of creativity in hernia repair occurred after World War II, when surgical specialization accelerated, surgical boards and fellowships proliferated, and modern anesthesia, drugs, and supportive patient care improved. In this setting, new methods for open anterior repair of inguinal hernias were created. There were those who claimed some repairs to be more anatomic in execution, while others explored hernia repair through the preperitoneal spaces. It was apparent to all that some hernias had excellent results with low recurrence rates (infants), while other inguinal hernias were complex, difficult to repair, and had poor outcomes (large inguinoscrotal ones or recurrences).

In 1959 Harkins presented a new classification system for inguinal hernias in the closing discussion of Nyhus' [5] paper on preperitoneal hernia repair in patients using the traditional classification. Harkins described four Grades: I, indirect infant; II, simple indirect; III, intermediate indirect or direct with narrow defects; IV, advanced, such as femoral, recurrent, or ones not included in grades II or III above. Another variation was published by Casten [6] in 1967 with Stage I being infants and children with a functioning internal ring mechanism; Stage II were large indirect hernias with a distorted internal ring, and III were all direct and femoral hernias. McVay and Chapp [7] segmented indirect hernias into small, medium, and large, and they considered femoral hernias to be a third

or distinct entity vs indirect and direct. In retrospect, American surgeons were using anatomic location (indirect, direct, and femoral), defect size (small, medium, and large), and anatomic integrity and function (internal ring or direct floor) in the construction of classification systems based upon objective descriptors of the inguinal region.

Halverson and McVay [8] enlarged their earlier hernia classifications into five groups in 1970. Group I were small indirect hernias of childhood; Group II were medium-sized indirect hernias with a dilated internal ring that did not encroach upon the lateral region of the direct floor; Group III were large direct hernias or massive indirect hernias, both of which had complete disruption of the direct floor space. Femoral hernias were site specific, and the final group was called combined hernias, as they involved a mixture of indirect, direct, or femoral defects. Direct hernias were further stratified by Lichtenstein [9], who in 1987 described five different types of direct defects based upon location or size: A (entire direct floor), B (lateral half of the direct floor), C (medial half of the direct floor), D (diverticular), and E (other).

Named classifications in common use today

Over the next few years, three new major classifications (Gilbert, Nyhus, and Schumpelick) were proposed, and they have become widely used. In the 1980s, Gilbert [10] brought together over 50 hernia surgeons into a registry for inguinal hernias called the Cooperative Hernia Analysis of Types and Surgeries (CHATS). This registry classified inguinal hernias into five types—three indirect and two direct. The three indirect ones were as follows: I small; II medium; and III large (greater than two finger-breadths width) in defect size. Gilbert's direct hernias were either a disruption of the entire direct floor (IV) or else a diverticular opening (V) of no more than one finger-breadth in width. Four years later in 1993, Rutkow and Robbins [11] expanded upon Gilbert's classification by adding a type VI—pantaloon with combined indirect and direct hernia sacs, plus a type VII, the femoral hernia (see Table 1).

Nyhus [12] first published his classification system in 1993, and it then appeared in the Nyhus and Condon *Hernia* 4th Edition [13]. This system was described as "an aide in the surgical decision-making thus matching the types of hernia with specific operation." In his classification, Nyhus used location, the sizes of the defect and the sac, and the integrity or function of the internal ring and direct floor, along with combinations of inguinal hernias and recurrences (see Table 1). A Nyhus Type I indirect hernia had a "normal size, configuration, and structure" of the internal ring and occurred principally in infants and children. The direct floor was intact, and the hernia sac stayed within the inguinal canal. The Type II indirect hernias have an "enlarged and distorted" internal ring without encroachment into the direct floor region. The sac does not descend into the scrotum. Nyhus then created three subcategories for his type III hernias. Type III-A includes all small- to medium-sized direct hernias that do not involve any protrusion through the internal ring. The Type III-B contains large indirect hernias with a defect that "expands medially and encroaches on the posterior inguinal wall or direct floor." These tend to be very large indirects, where the sac becomes inguinoscrotal in location. Additionally, sliding inguinal hernias that "always destroy a portion of the inguinal floor" and pantaloon hernias with discrete direct and indirect sacs on either side of the epigastric

Table 1 Definitions used for defect sizes in named classifications of inguinal hernias

	Gilbert	Nyhus	Schumpelick
Indirect			
Small	1 Snug	I Normal size internal ring	L1 < 1.5 cm
Medium	2 Moderately dilated ring	II Enlarged & dilated ring without impinging direct floor	L2 1.5–3 cm
Large	3 Greater than two finger-breadths	IIIB Large dilated internal ring with medial expansion & encroachment of posterior (direct floor) inguinal wall	L3 > 3 cm
Direct			
Small	5 Diverticular	IIIA No more than one finger-breadth	M1 < 1.5 cm
Medium	—	IIIA	M2 1.5–3 cm
Large	4 Entire floor	—	M3 > 3 cm
Combined			
Pantaloon	6 Combined	III-B	Mc
Femoral			
Femoral	7 Femoral	IV-C	F

vessels are included in the Type III-B. Femoral hernias were classified as a stand-alone Type III-C. Recurrent inguinal hernias became Type IV with directs as IV-A; indirects as IV-B, femorals as IV-C; and any combinations of these three regions as IV-D. The Nyhus classification is widely used in the United States and Europe, where it was modified by Stoppa [14] in 1998 to include "aggravating factors" that would upstage each Nyhus Type by one.

The third major classification was created in 1995 by Schumpelick [15]. It added orifice sizing to the traditional system. He used "L" for the lateral indirect site, "M" for the medial direct one, and "F" for femoral. The defect sizes were graded as I being < 1.5 cm in diameter; II being 1.5–3.0 cm; and III being > 3 cm. Lastly, he classified the pantaloon (direct + indirect) inguinal hernias as "Mc." The Schumpelick classification system is used principally in Europe, as it has not been widely published in American surgical journals.

Towards consensus

Several other classification systems have been proposed over the past 15 years, including ones by Bendavid, Alexander, and Zollinger. Each attempted to unify the best features of existing systems so as to be all-inclusive. These have been reviewed in detail previously by the author [16]. However, hernia surgeons have not settled upon a single classification. As it currently stands, there are too many classifications—a theme reinforced by Nyhus [17] during his presentation at the 2nd International Hernia Congress in 2003. They are difficult to remember and are overly complex. Inguinal hernias are also notoriously difficult to identify accurately before surgery, even using modern ultrasound imaging techniques [18]. And finally, there is a different anatomic perspective for the open (anterior) surgeon vs the laparoscopic (posterior) surgeon. For example, is a gentle

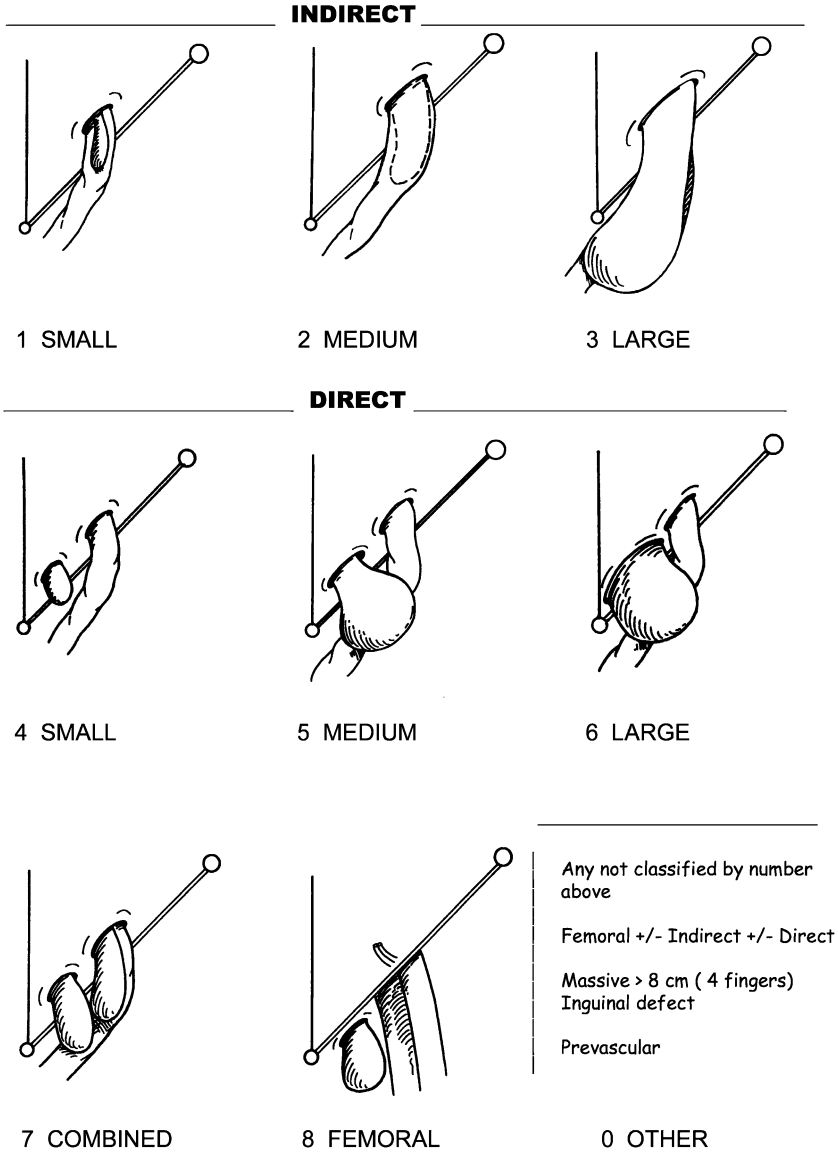

Fig. 1 Updated traditional classification for inguinal hernias

bowing of the direct floor observed during retroperitoneal insufflation at laparoscopy really a direct hernia if it is asymptomatic and not detectable on physical exam using the usual exertional maneuvers?

Several consensus conferences sponsored by the European Hernia Society and the German Surgical Society [19] have examined hernia classifications. It appears we hernia surgeons cannot agree upon a universal system or even definitions. Table 1 lists the contrasting definitions used by Gilbert, Nyhus, and Schumpelick. For all practical purposes, a small (indirect or direct) is <1.5 cm or a fifth fingertip in diameter. Large defects are also fairly straightforward, being in the range of >3 or 4 cm or two finger-breadths (the surgeon's index plus third finger) in width. Medium defects are clear to Schumpelick (1.5–3 cm), but are judged empirically by Gilbert or by the loss of anatomic integrity of the direct floor space by Nyhus. In this regard, the Nyhus classification presents the most thorough descriptions of the direct floor integrity and the internal ring functionality, plus it adds descriptors concerning the size and descent of the sac—features that correlate well with the size of hernia defects. Accordingly, there is no consensus as to the definition of defect size or anatomic function that could form the basis for a universal classification.

The updated traditional classification

What hernia surgeons need is a system that allows easy for easy categorization of our data, such that it can be utilized for comparative observations. The classification system must be easy to remember and should stratify hernia complexity in a useful manner. An expanded or updated traditional system (Fig. 1) fulfills these criteria. It has many elements in common with the classification systems of Gilbert, Nyhus and Schumpelick [20] and a comparative summary of these systems is shown in Table 2. The updated traditional system appears in the left hand column. It is expanded by the addition of (0) Other—a category that should contain only 1 or 2% of inguinal hernias, and by the use of small, medium, and large for both indirect and direct hernias. It does not contain any overlapping types, and it is all-inclusive. The Nyhus-Stoppa system contains two overlaps—Types (IIIA and IIIB), and it does not describe large direct or Other (complex) ones. The Gilbert system with the Rutkow and Robbins modification lacks a type for medium direct hernias and for Other (complex) ones. The Schumpelick system is the obvious prototype for the updated traditional, as it only needs an Other (complex) category.

Table 2 Comparison of inguinal hernia classifications

Traditional-updated	Nyhus-Stoppa	Gilbert	Schumpelick
1 Indirect small	I	1	L1
2 Indirect medium	II	2	L2
3 Indirect large	IIIB	3	L3
4 Direct small	IIIA	5	M1
5 Direct medium	IIIA	—	M2
6 Direct large	—	4	M3
7 Combined	IIIB	6	Mc
8 Femoral	IIIC	7	F
0 Other	—	—	—

Table 3 Proposed modifiers for inguinal hernia classifications

Reducible
Incarcerated
Strangulated
Sac contents
Bowel
Omentum
Fluid
Other
No sac
Preperitoneal fat
Slider
Colon
Small bowel
Bladder
Other
Associated abnormality
Lipoma
Hydro or Varicocoele
Recurrent (#)

Finally, additional modifiers are needed for all classification systems. They are used to describe the coexisting conditions and findings. The most obvious example is the one describing primary vs recurrent hernias. The other modifiers for the most part, define the sac contents and their viability. A proposed list is shown in Table 3.

Conclusions

The traditional classification of inguinal hernias is the most widely used system today. However, it does not describe all inguinal hernias or their levels of complexity. Named classification systems over the past 40 years have more precisely defined the hernia defects by size and location and by their effect upon anatomic integrity of the direct floor and upon the function of the internal ring. Fortunately, there are many common features among these competing named classification systems. These features are incorporated into an updated traditional classification (Fig. 1), which is now inclusive. This updated traditional system of classification allows better stratification of inguinal hernia complexity. It is easy to remember and to use, as it builds upon the traditional terms already in common use by all surgeons.

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