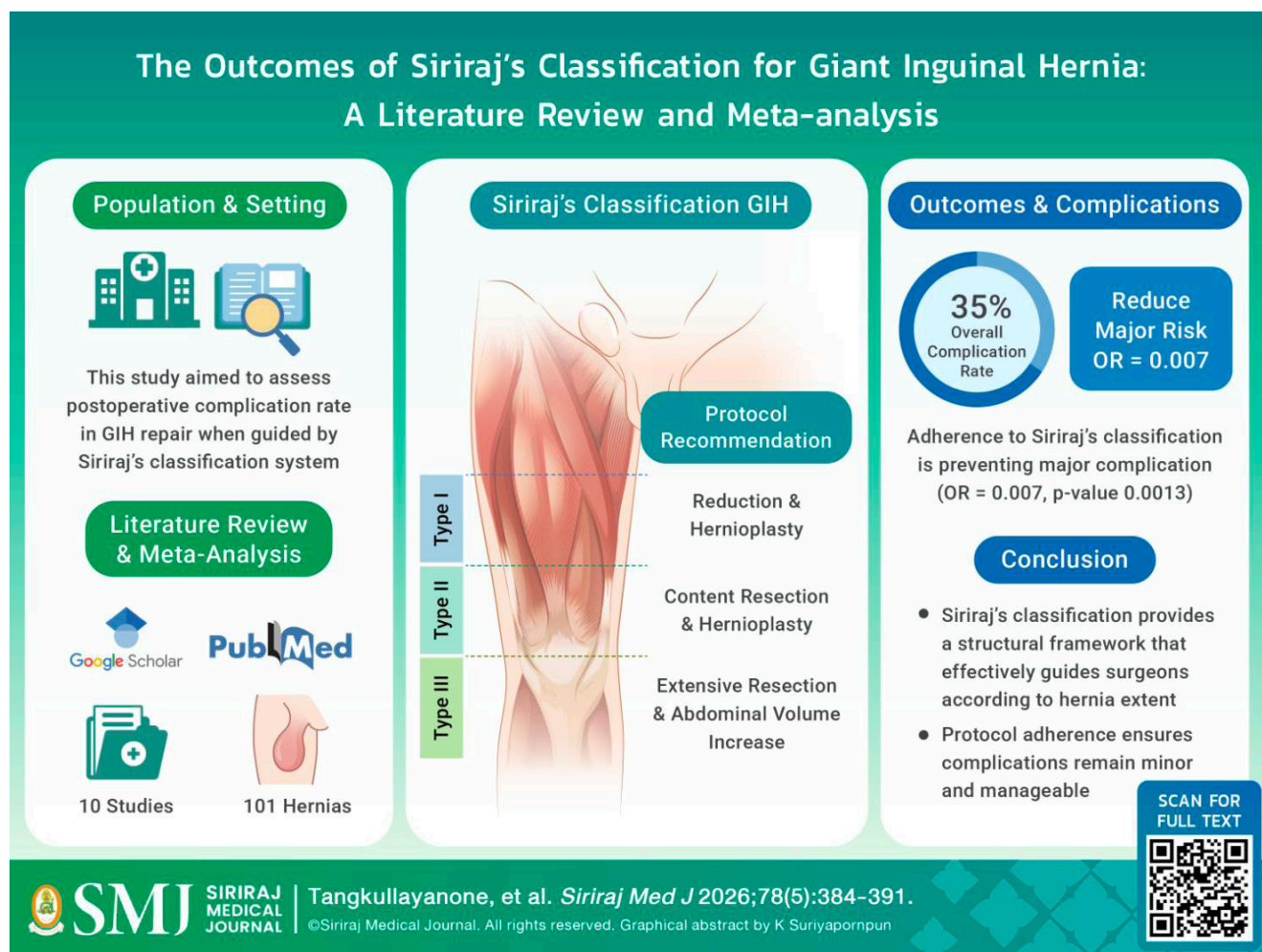


The Outcomes of Siriraj's Classification for Giant Inguinal Hernia: A Literature Review and Meta-analysis

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ABSTRACT

Objective: Giant inguinal hernia is a rare condition associated with high perioperative morbidity. Siriraj's classification was developed to guide surgical management according to hernia extent; however, clinical outcome data remain limited. This study aimed to evaluate postoperative complications associated with giant inguinal hernia repair according to Siriraj's classification.

Materials and Methods: A literature review and proportion meta-analysis were conducted to assess the surgical outcomes of giant inguinal hernia repair. PubMed and Google Scholar were systematically searched for studies reporting surgical management and complications of giant inguinal hernia. Studies were included if the hernia type could be classified according to Siriraj's classification or sufficient clinical information was available. The primary outcome was postoperative complications. Pooled complication rates with 95% confidence intervals (CI) were calculated using fixed- or random-effects models based on heterogeneity.

Results: Ten studies involving 101 giant inguinal hernias were included in the meta-analysis. The overall postoperative complication rate was 35% (95% CI: 0.17–0.59). Type I giant inguinal hernia showed a complication rate of 43%, while non-Type I hernias demonstrated a complication rate of 37%. Although overall complication rates were comparable, major complications were predominantly observed in cases not adhering to Siriraj's classification. Protocol adherence was significantly associated with reduced risk of major complications (odds ratio 0.007, 95% CI: 0.0003–0.142; $p=0.0013$).

Conclusion: Siriraj's classification provides a practical framework for guiding surgical management of giant inguinal hernia and may reduce major postoperative complications. Further large-scale studies are required to validate these findings.

Keywords: Giant inguinal hernia; hernia repair; surgical outcomes; postoperative complications; classification; meta-analysis (Siriraj Med J 2026;78(5):384-391)

INTRODUCTION

Indirect inguinal hernia is one of the most common surgical problems, characterized by a protruding mass from the deep inguinal ring. The pooled prevalence of inguinal hernia is 7.7%.¹ In contrast, a giant inguinal hernia, defined as a hernia extending below the midpoint of the inner thigh in the standing position, is less commonly found. The prevalence of giant inguinal hernia is very

low, less than 5% in developed countries.² In 2014, our institute proposed a classification system for giant inguinal hernias, consisting of three types as demonstrated in Fig 1.³

- **Type I:** Giant inguinal hernia where the sac extends between the mid-inner thigh and an imaginary line midway between the mid-inner thigh and the suprapatellar level.

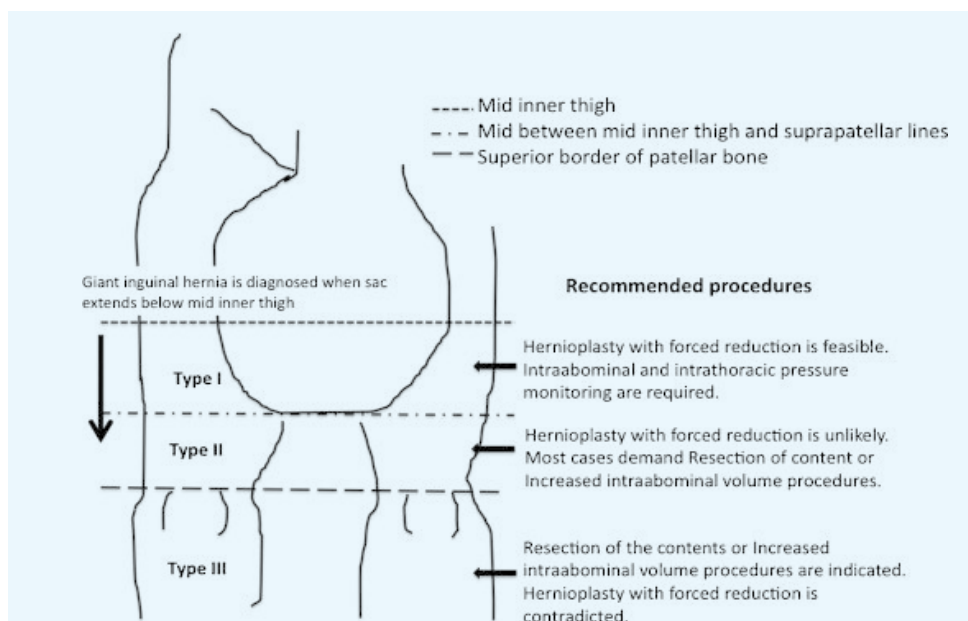


Fig 1. Siriraj's classification of giant inguinal hernia and recommended procedures.³

- **Type II:** Hernia where the sac extends beyond the imaginary line but does not exceed the superior border of the patellar bone.
- **Type III:** The most extended type, where the sac extends below the superior border of the patellar bone.

The purpose of describing this classification is to suggest appropriate surgical treatments. The principle of treatment for all types is the reduction of the hernia contents and hernioplasty. This standard procedure is sufficient for Type I giant inguinal hernia when combined with intraoperative or postoperative intra-abdominal pressure monitoring. In cases where the sac is larger, as in Type II, hernioplasty and content reduction alone might not be safe due to the risk of abdominal hypertension, thus necessitating content resection. Furthermore, for Type III giant inguinal hernia, which has the largest sac volume, hernioplasty and content reduction are contraindicated. This type requires at least extensive content resection and is usually combined with procedures to increase abdominal volume.

MATERIALS AND METHODS

Study design and reporting standards

This study was conducted as a literature review with a proportion meta-analysis to evaluate the surgical outcomes of giant inguinal hernia repair according to Siriraj's classification. The study methodology was designed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines where applicable.

Search strategy

A systematic literature search was performed in PubMed and Google Scholar from database inception to November 2023. The search strategy included the following terms: ("adult" OR "adult*") AND ("giant inguinal hernia" OR "giant inguinoscrotal hernia"). Reference lists of relevant articles and citation tracking were also performed to identify additional eligible studies.

Eligibility criteria

Studies were included if they:

1. Reported surgical management of a giant inguinal hernia,
2. Provided sufficient clinical information to classify hernia type according to Siriraj's classification or explicitly used this classification,
3. Reported postoperative outcomes or complications.
4. Studies were excluded if they were non-operative studies, non-English publications, lacked sufficient

clinical detail for classification, or used alternative classification systems.

Study selection

Two investigators independently screened titles, abstracts, and full texts for eligibility. Disagreements were resolved through discussion.

Data extraction

Data extracted included patient demographics, hernia type, diagnostic investigations, surgical approach, adherence to Siriraj's classification, and postoperative complications.

Outcome measures

The primary outcome was postoperative complication rate. Secondary outcomes included severity of complications and the association between protocol adherence and major complications.

Protocol registration

This study was conducted based on a predefined research protocol. The review protocol was not prospectively registered due to its retrospective design, but followed established literature review methodology.

Ethics statement

This study involved secondary analysis of previously published data. Ethical approval and informed consent were not required.

RESULTS

The search was conducted in November 2023. The database and manual search yielded 142 articles. After removing 31 duplicates, 111 articles were reviewed based on their abstracts. Following abstract screening, 70 articles were selected for full-text review. Ultimately, 37 articles met the inclusion criteria for an in-depth review. Ten of these articles⁴⁻¹³, which met the criteria for meta-analysis, were analyzed, while the remaining 27 articles were assessed and categorized by each individual type as shown in Fig 2.¹⁴⁻⁴⁰

We derived the pooled prevalence with a 95% confidence interval (CI) of the complications of procedures conducted on giant inguinal hernias. The I^2 statistic was used to determine the heterogeneity of the gathered data. A random-effects model was used when I^2 was $>50\%$, and a fixed-effects model was used when I^2 was $<50\%$.

Of the 10 publications, there were 99 male patients and 101 giant inguinal hernias. The mean age was 61.2 years. Type I giant inguinal hernias accounted for 68 hernias,

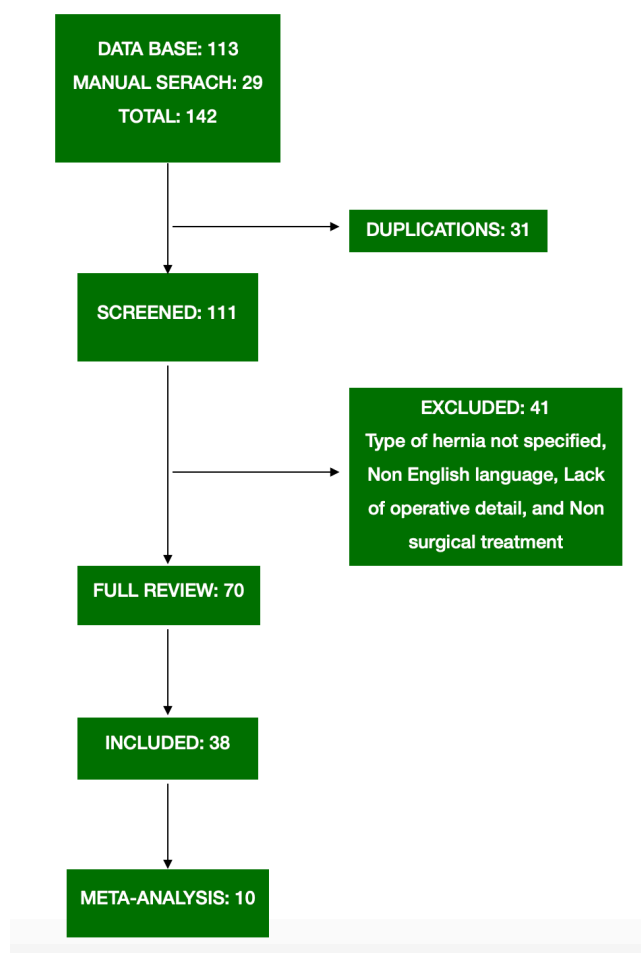


Fig 2. The flow diagram of the literature review.

and non-Type I giant inguinal hernias accounted for 33 hernias. The most common investigation performed prior to specific surgical treatment was computed tomography (CT), particularly in non-Type I giant inguinal hernias. In contrast, only 11.8% (8 hernias) of Type I giant inguinal hernia cases underwent CT scans, with the majority needing only physical examination to determine the hernia type.

The surgical approach for Type I giant inguinal hernia was predominantly laparoscopic in 91.2% (62

hernias) of cases, with the open approach used in 8.8% (6 hernias). For non-Type I giant inguinal hernias, the open approach was used in 69.7% (23 hernias). The most common technique for laparoscopic repair was transabdominal preperitoneal (TAPP) hernioplasty. Various techniques were used for open approaches, including Lichtenstein, retrorectus, or preperitoneal hernioplasty.

In the case of Type I giant inguinal hernia, all 68 hernias in five publications followed Siriraj's classification. Fourteen complications were reported, but all were minor. The complication rate for Type I giant inguinal hernia was 43% (95% CI: 0.09-0.85) with a random effects model ($I^2 = 81.03\%$) (Fig 3).

Since there was only one publication reporting on Type III giant inguinal hernia treatment and complications, five publications with Type II and Type III giant inguinal hernias were categorized into the non-Type I giant inguinal hernia group. Out of 33 hernias in this group, complications were reported in 11 hernias. The overall complication rate was 37% (95%CI: 0.21-0.55). When subgrouped by adherence to Siriraj's classification, as shown in Fig 4, the complication rate for non-Type I giant inguinal hernia cases that followed the protocol and non-followed the protocol were 36% (95% CI: 0.16-0.62) and 36% (95% CI: 0.14-0.66), respectively. In non-followed protocol article⁹, four major complications were noted, including abdominal compartment syndrome and abdominal hypertension, while only minor complications were found in the followed protocol subgroup.^{4,7,8,11} Although overall complication rates were comparable, major complications occurred predominantly in non-protocol cases.

Out of 99 patients, complications were found in 25 patients. According to the Clavien-Dindo classification⁴¹, serious complications (grade IIIb-V) were found in 4 patients, including abdominal hypertension and pulmonary embolism. Minor complications (grade I-IIIa) consisted of seroma, hematoma, surgical site infection, and abscess.

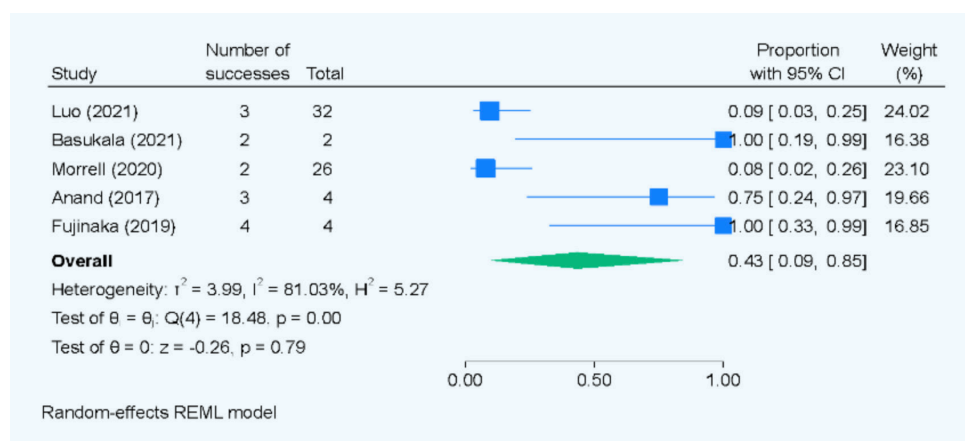


Fig 3. Complications of type I giant inguinal hernia.

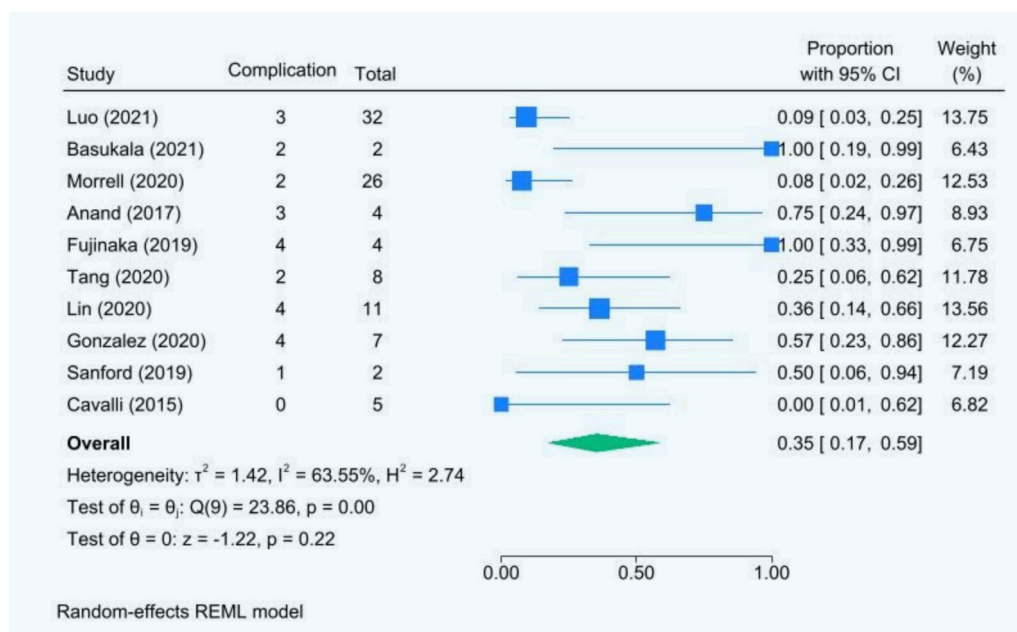


Fig 4. Overall complications.

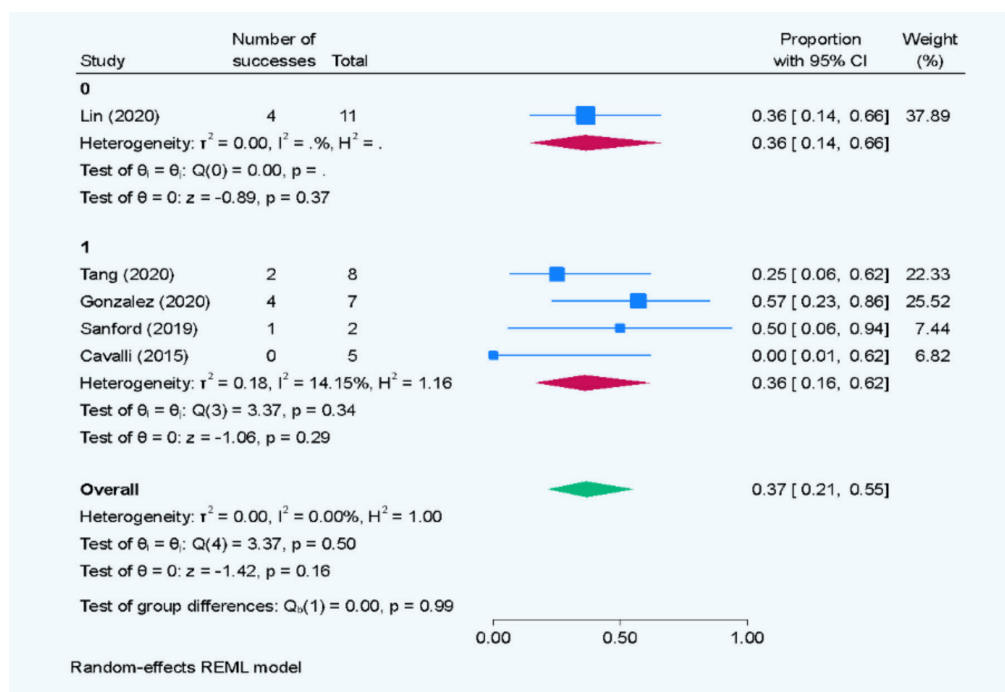


Fig 5. Complications of non-type I giant inguinal hernia.

The overall complication rate was 35% (95% CI: 0.17-0.59) based on a random effects model ($I^2 = 63.55\%$) (Fig 2). Focusing on Siriraj's classification and surgical complications, the odds of major complications in the protocol group and odds of major complications in the non-protocol group were calculated. Fisher's Exact test was used to determine nonrandom associations between two categorical variables. The odds ratio (OR) was 0.007 (95% CI: 0.0003-0.142, p -value 0.0013), which means adhering to the protocol is highly effective in preventing major complications.

DISCUSSION

Inguinal hernia repairs typically exhibit overall complication rates ranging from 2.9% to 8%, commonly involving bleeding, wound infection, and cardiovascular or pulmonary complications. However, giant inguinal hernias are associated with higher complication rates. Previous systematic reviews have reported an overall complication rate of 39% for giant inguinal hernias, with more severe complications such as abdominal compartment syndrome, bowel injury, or Fournier's gangrene. To mitigate these hazardous events, surgical

protocols tailored to the type of giant inguinal hernia are imperative.

Type I giant inguinal hernias are often diagnosed by clinical examination or simple investigations such as CT scans. Our protocol suggests that this type requires content reduction, intraoperative intraabdominal pressure monitoring, and hernioplasty. Surgical approaches can be achieved through either open or laparoscopic methods. From our review, 91.2% of Type I cases were managed laparoscopically, mainly via transabdominal preperitoneal hernia repair (TAPP). Despite the higher number of complications compared to non-giant inguinal hernias, all complications were minor and treatable with conservative treatment.

Type II giant inguinal hernias pose greater surgical challenges and typically require CT scans to determine the extent of visceral involvement. Approaches may include open, laparoscopic, or hybrid methods. Forceful reduction of the hernia contents is often difficult and can lead to abdominal hypertension, thus organ resection might be unavoidable. Commonly removed contents from the hernia sac include the greater omentum, orchidectomy, or bowel segments. Alternatively, increasing intra-abdominal volume through progressive pneumoperitoneum in the first stage, followed by content reduction with hernioplasty in the second stage, may be performed without extensive organ resection.

Massive inguinal hernias, such as type III, require at least a CT scan and abdominal CT volumetry to assess for loss of domain. Hernioplasty and forceful reduction are contraindicated due to the risk of fatal complications. To mitigate abdominal compartment syndrome or respiratory failure, extensive organ resection may be necessary, possibly combined with progressive pneumoperitoneum. Prediction of abdominal hypertension through preoperative CT volumetry, using the ratio of hernia sac volume divided by abdominal cavity volume ≤ 0.25 , is crucial. If prediction methods such as the Tanaka or Sabbagh method indicate the possibility of abdominal hypertension, procedures to increase abdominal volume are warranted. Additionally, perioperative and postoperative intraabdominal pressure monitoring must be mandatory.

Limitations

This study has several limitations. Firstly, it is not a systematic review but rather a literature review, and the search strategy was not as strict as systematic review guidelines. Specific inclusion criteria were set only for Siriraj's classification. Secondly, due to the rarity of this condition, many publications are case reports, case series,

or retrospective studies, which may have impacted the power of our meta-analysis. Lastly, a significant number of studies did not include follow-up protocols or have significant follow-up periods, thus limiting the collection of data on recurrence rates among giant hernia types, which is a crucial long-term outcome of treatment.

CONCLUSION

The classification and management of giant inguinal hernia remain heterogeneous and technically demanding. This study suggests that Siriraj's classification provides a practical, structured framework to guide operative strategy according to hernia extent. While overall complication rates were comparable, adherence to classification-guided management was associated with a significant reduction in major postoperative complications. In particular, Type I giant inguinal hernias may be safely managed with reduction and hernioplasty—predominantly via laparoscopic TAPP with intra-abdominal pressure monitoring—whereas non-Type I hernias frequently require adjunctive procedures to prevent abdominal compartment syndrome.

Although limited by a small sample size and substantial heterogeneity, these findings offer clinically relevant preliminary guidance in an area lacking standardized management algorithms. Further prospective, large-scale studies are warranted to validate these recommendations and refine operative strategies for each hernia type.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. Most of the relevant references are already cited and available in the bibliography.

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Conflict of Interest

The authors declare no competing interests.

Registration Number of Clinical Trial

Not applicable.

Author Contributions

Conceptualization and methodology, W.T., A.T., T.A., A.M., and V.C. ; Developed the review article, W.T. and A.T. ; Formal analysis, W.T., R.K., and J.P. ; Visualization and writing – original draft, W.T. and A.T. ; Writing – review and editing, W.T. and A.T. ; Supervision, A.T. All authors have read and agreed to the final version of the manuscript.

Use of Artificial Intelligence

No artificial intelligence tools or technologies were utilized in the writing, analysis, or development of this research.

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