114 年疝氣醫學會冬季研習會
Taiwan Hernia Society Winter Workshop

Laparoscopic or open in pediatric hernia: evidence and practice

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2025/12/20

Clinical Outcomes, Guidelines, Recovery, Cost-Effectiveness, and Parental Perspectives

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  - Complications
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- Guidelines and Consensus: Indications for Laparoscopic vs Open Repair
  - Traditional Gold Standard vs New Standard
  - Bilateral Hernias and Contralateral Exploration
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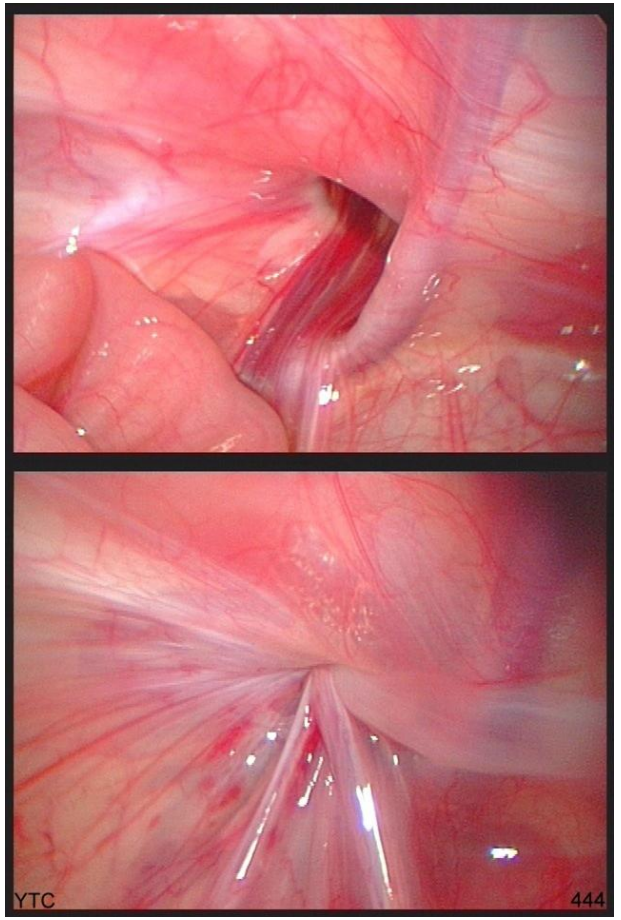
Clinical Outcomes
Hernia Recurrence & Reoperation

- Overall recurrence is low with both techniques.
- Meta-analysis (2022, n = 91,653):
  - No significant difference in recurrence (Laparoscopic 1.57% vs Open 1.34%).
- Large U.S. database (n = 53,287):
  - Higher recurrence with laparoscopy in general practice (1.5% vs 0.4%) → operator experience matters.
- In experienced centers: recurrence rates are comparable.



Clinical Outcomes
Contralateral Hernia & Reoperation

- Open repair:
  - Contralateral side not addressed
  - 10–15% develop metachronous hernia → second surgery
- Laparoscopic repair:
  - Allows inspection and closure of contralateral PPV
  - Significantly reduces future contralateral hernia

Clinical Outcomes

Ipsilateral recurrence vs contralateral operations

Laparoscopy may have higher recurrence in low-volume settings, but reduces contralateral hernia; overall reoperation rates are similar when performed by experienced surgeons.

Clinical Outcomes Complications

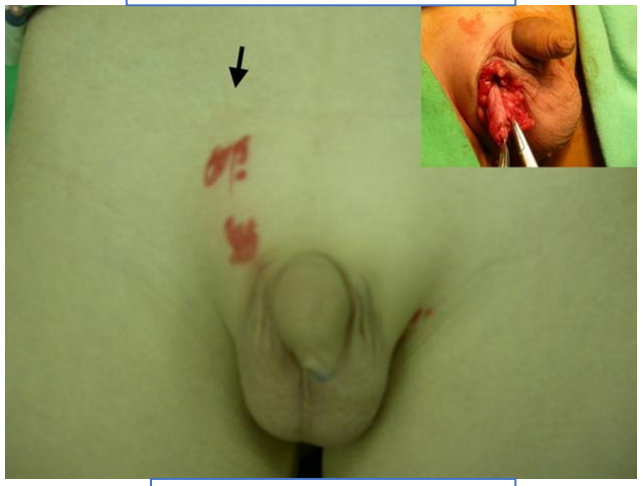
- Major complications are rare with both techniques.
- Systematic review:
  - Overall postoperative complications ~50% lower with laparoscopy.
- Laparoscopic repair:
  - No groin incision
  - Lower wound infection & scarring
- Open repair:
  - Small inguinal incision
  - Low but present risk of wound infection / hematoma (<1–2%)

Clinical Outcomes
Testicular Complications (Key Difference)

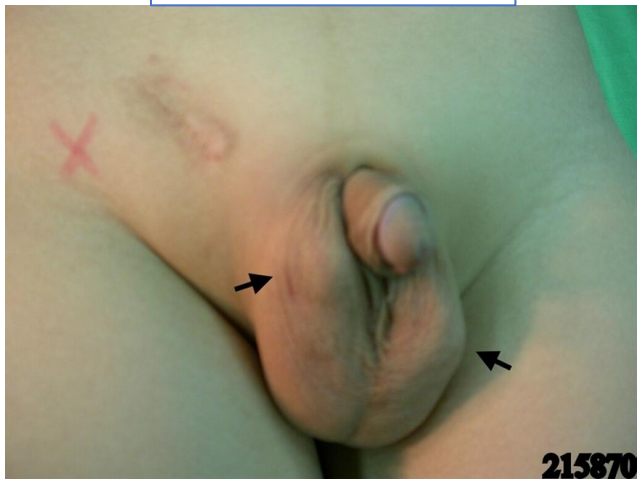
Both approaches are safe, but laparoscopy is associated with fewer overall complications and a markedly lower risk of testicular injury.

- Testicular atrophy / ascent: rare but important
- Meta-analysis:
  - Open repair: ~1.5%
  - Laparoscopic repair: ~0.01%
- Cause:
  - Open repair → spermatic cord manipulation
  - Laparoscopy → minimal cord disturbance

Testicular atrophy



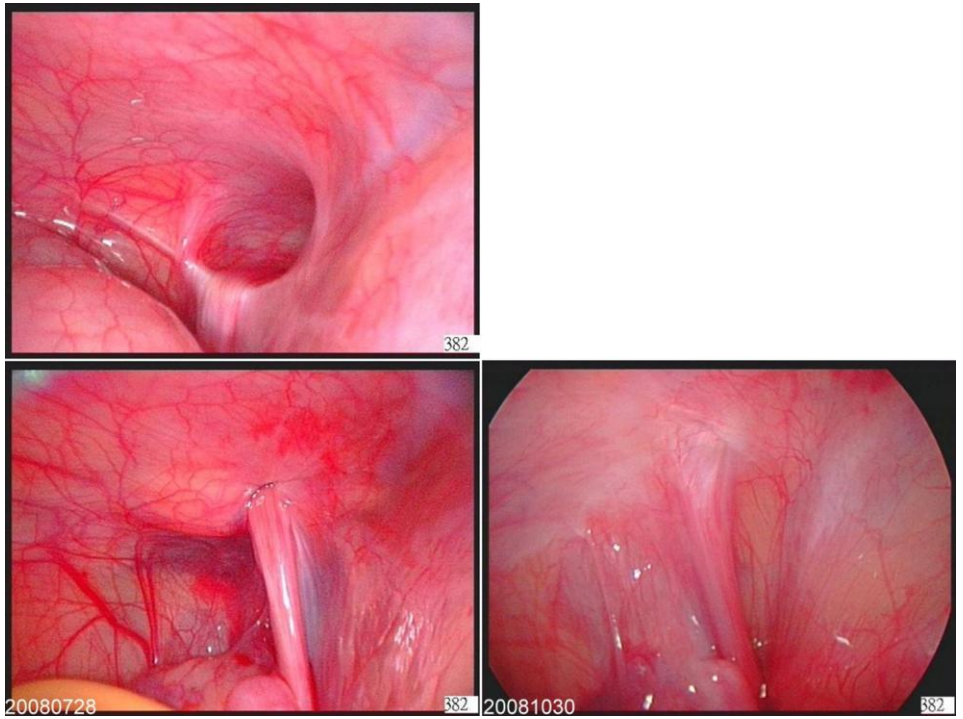
Testicular ascent



Clinical Outcomes
Success Rates --

Both techniques are considered effective and the choice often comes down to surgeon expertise and specific case considerations.

- Both techniques achieve excellent outcomes in experienced hands.
- Open herniotomy:
  - Decades of proven safety
  - Recurrence ≈ ≤1% in most series
- Laparoscopic repair:
  - Early concerns resolved with experience
  - Comparable recurrence rates
  - Fewer complications in recent studies
- Additional advantages of laparoscopy:
  - Easier bilateral repair
  - Better cosmetic results
  - Fewer secondary (contralateral) hernias



Guidelines and Consensus
Traditional Gold Standard vs New Standard

Guideline Perspective: AAP 2023

- Open repair:
  - Long-standing gold standard
- AAP 2023 statement:
  - Laparoscopic repair is “at least as effective as, if not better than” open repair
- Recurrence concern:
  - Early worries about higher recurrence largely disproven
- Conclusion:
  - Minimally invasive repair is safe
  - Outcomes not compromised
  - Supported for use in appropriate cases

Guidelines and Consensus
Bilateral Hernias and Contralateral Exploration --

Laparoscopy is the preferred approach for bilateral disease and selective contralateral evaluation, reducing operative time and reoperation risk.

- International guidelines favor laparoscopy for bilateral inguinal hernias.
- IPEG 2020 (Level 1 evidence):
  - Shorter operative time for bilateral repair with laparoscopy
- Laparoscopy advantages:
  - Both sides repaired via same ports
  - Reduced total anesthesia time
- Contralateral evaluation:
  - Laparoscopy allows inspection of opposite side
  - Routine open contralateral exploration is not recommended
- Clinical implication:
  - Laparoscopy preferred in suspected bilateral hernia or high-risk for contralateral hernia
  - Helps avoid second operation

Herniotomy vs. Single-port extracorporeal repair

Patients (N)	IH Group (86)	LH Group (116)	*P*
Unilateral: bilateral repairs	80:6	60:56	< 0.001
Mean operation time (min)	22.7 ± 12.7	49.7 ± 28.9	< 0.001
Patient with unrelated operations (N) (%)	3 (3.5)	24 (20.7)	< 0.001
Patient without unrelated operations (unilateral repair: bilateral repairs)	77:6	50:42	< 0.001
Operation time (unilateral) (min)	20.0 ± 6.3	40.1 ± 16.4	< 0.001
Operation time (bilateral) (min)	37.5 ± 16.7	46.0 ± 18.3	0.291
Contralateral occurrence (N) (%)*	6 (7.5)	0	0.005
Recurrence (N)	0	0	1
Follow-up (mo)	36.3 ± 7.7	35.3 ± 6.8	0.337

Chang et al, 2012

Guidelines and Consensus Recurrent Hernias –

Many pediatric surgeons will choose the opposite approach for a recurrence to minimize complications.

- Expert consensus favors laparoscopy for recurrent hernias (a hernia that returns after a previous open repair)
- Why laparoscopy?
  - Avoids scarred groin tissue
  - Approaches recurrence from inside the abdomen
- AAP guidance:
  - Laparoscopy is feasible and effective for recurrent cases
- Clinical relevance:
  - Recurrence is uncommon
  - Laparoscopy expands surgical options and safety

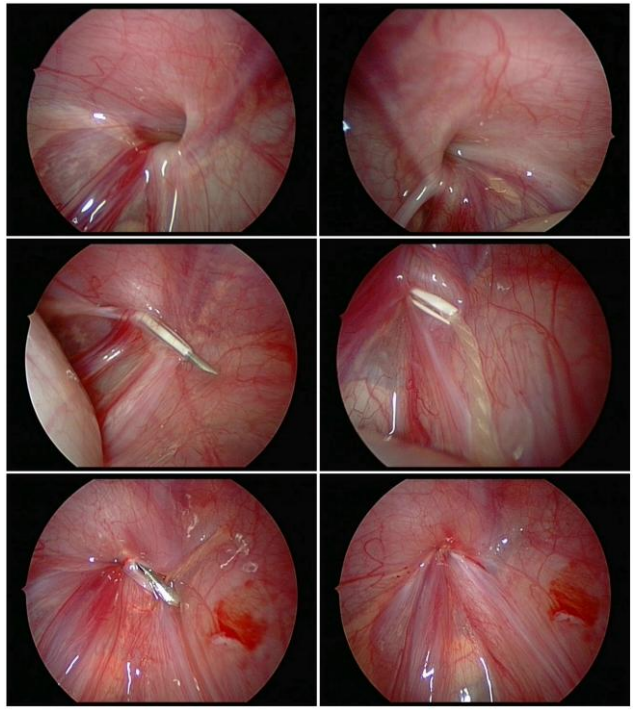
Guidelines and Consensus
Young Infants and Preterm Neonates

- Primary concern:
  - Timing & anesthetic risk, not surgical technique
- AAP 2023:
  - Elective repair in preterm infants may be deferred until after NICU discharge
  - Reduces respiratory complications without increasing incarceration risk
- Technique selection:
  - No global consensus favoring open or laparoscopic repair in neonates
  - Decision based on surgeon expertise & resources

Guidelines and Consensus
Young Infants and Preterm Neonates

In neonates and preterm infants, timing and anesthetic safety outweigh technique choice; surgeon expertise should guide the approach.

- Laparoscopy:
  - Feasible even in infants <3 months in experienced centers
  - Technically demanding (limited working space)
- Open repair:
  - Common in neonates due to speed and simplicity
- Key principle (IPEG):
  - Best outcomes achieved when the surgeon uses the technique they perform most safely



86-day-old, 2270gm male infant with bilateral inguinal hernias

Babies weighing < 5 kg compared with >5 kg

Weight	*5 kg or less*	*>5 kg*	P
Patient number without/with unrelated operations	33/20	141/20	<.001
Mean operating time (minute)	45.0 ± 16.2	35.8 ± 15.6	.003
Male/female	18/15	93/48	.219
Weight (kg)	3.2 ± 0.9	18.1 ± 11.1	<.001
Prematurity (%)	16 (48.5)	1 (0.7)	<.001
Both sides simultaneous operation (%)	24 (72.7)	47 (33.3)	<.001
Sliding hernia (%)	6 (18.2)	3 (2.1)	<.001
Incarceration (%)	1 (3.0)	6 (4.3)	.747
Needlescopy (%)	2 (6.1)	27 (19.1)	.069

Chang YT et al, 2011

Guidelines and Consensus
Surgeon Volume and Training –

Surgeon experience matters more than technique; the safest approach is the one performed well by an experienced surgeon.

- AAP: Higher surgeon volume → lower recurrence
- Lowest recurrence:
  - Fellowship-trained pediatric surgeons
- Highest recurrence:
  - General surgeons performing <10 pediatric cases/year
- Practice trend:
  - High-volume centers increasingly favor laparoscopy
  - Open repair remains reliable where MIS expertise is limited
- Consensus:
  - No single mandated technique
  - Both open and laparoscopic repairs are acceptable
  - Laparoscopy often default for older children & bilateral hernias

Recovery Time and Hospital Stay
Postoperative Pain –

Postoperative pain is mild and comparable between open and laparoscopic repair.

- Postoperative pain is mild with both techniques
- Usually controlled with acetaminophen or ibuprofen
- No consistent difference in pain scores between approaches
- Infants:
  - Regional anesthesia (e.g. caudal block) → minimal immediate pain for either technique

Recovery Time and Hospital Stay
Resumption of Activities –

Recovery is fast and hospital stay is short with both open and laparoscopic repair.

- Rapid recovery with both techniques
- Laparoscopy:
  - Slightly earlier return to activity in some studies
  - Clinical difference is small
- Meta-analysis:
  - No significant difference in recovery time or length of stay
- Hospital stay:
  - Usually day surgery or <24 hours
  - Overnight observation mainly for infants or anesthesia risk

Recovery Time and Hospital Stay
Day-Case Surgery –

Both open and laparoscopic repairs are well suited for ambulatory surgery, with rapid recovery and high family satisfaction.

- Shift to day surgery benefits both approaches
- Outpatient repair:
  - Avoids overnight stay
  - Reduces family stress & healthcare cost
- Laparoscopy:
  - Well suited for same-day discharge within ERAS pathways
- Open repair:
  - Also safely performed as day surgery in many centers
- Evidence:
  - Day-surgery outcomes as safe as overnight admission
  - High parental satisfaction
- Recovery timeline:
  - Infants: comfortable in a few days
  - Older children: return to sports in 1–2 weeks

Recovery Time and Hospital Stay
Special Situations

Hospital stay is driven by patient factors, not surgical technique; recovery is rapid with both open and laparoscopic repair.

- Premature infants / medically complex children:
  - Longer stay may be needed for apnea or medical monitoring
  - Independent of surgical technique
- Laparoscopy in very small infants:
  - May slightly increase anesthesia time (equipment setup)
  - No significant impact on recovery with proper monitoring
- Typical pediatric patients:
  - Similar hospital stay and recovery for open vs laparoscopic repair
  - Differences measured in hours, not days
- Overall:
  - – Rapid recovery expected with both approaches

Cost-Effectiveness Considerations
Operating Room Time and Cost

With experience, laparoscopic repair achieves comparable or shorter operative times—especially for bilateral hernias—offsetting some equipment-related costs.

- Early concern:
  - Laparoscopy requires specialized instruments & setup
- Current evidence:
  - Unilateral hernia: operative time now comparable
  - Laparoscopy may be slightly faster in experienced hands
- Bilateral hernia:
  - Laparoscopy is faster than two open repairs
  - Saves anesthesia and OR time
- Meta-analysis (2024 RCTs):
  - Shorter operative time with laparoscopic bilateral repair
- Cost considerations:
  - Laparoscopy: added equipment (ports, scopes, sutures)
  - Open repair: basic instruments
  - Equipment costs usually modest, but depend on reuse efficiency

Cost-Effectiveness Considerations Preventing Second Operations

By preventing contralateral hernia and repeat surgery, laparoscopic repair can be cost-effective despite higher initial costs.

- Key economic benefit of laparoscopy:
  - Prevents second operation for contralateral hernia
- Open repair:
  - ~10% develop contralateral hernia → repeat surgery & anesthesia
- Laparoscopy:
  - Detects & closes occult contralateral defects
  - Reduces future surgery

- UK cost analysis (Lam et al., 2022):
  - Higher initial cost for laparoscopy
    - ~£300 (day-case)
    - ~£140 (overnight stay)
  - When second operations included:
    - Cost-saving for overnight cases
    - Cost-neutral for day surgery
- Bottom line:
  - Higher upfront cost can be offset by fewer reoperations

Cost-Effectiveness Considerations
Day-Case vs Inpatient Costs

Open repair is cost-effective for simple day cases, while laparoscopy becomes economically competitive in admitted or higher-risk patients.

- Day-surgery, straightforward hernia:
  - Open repair slightly more cost-effective
  - Minimal resources
  - Low contralateral hernia risk
- Cases requiring admission (e.g. infants, apnea monitoring):
  - Cost difference narrows
  - Laparoscopy may be favored when overall costs considered
- Global trend:
  - Cost gap between techniques is decreasing
  - Laparoscopic workflows becoming more efficient
- Ongoing evidence:
  - HERNIIA trial (Europe) will provide robust data on cost-effectiveness

Cost-Effectiveness Considerations
Equipment and Training Costs

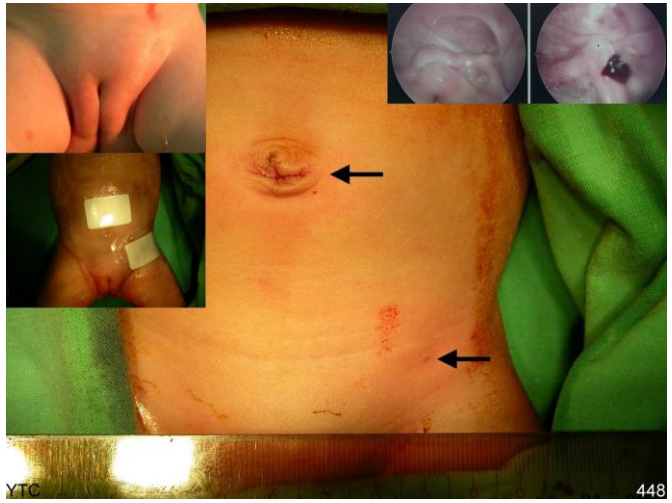
Cost-effectiveness depends on setting: open repair suits low-resource environments, while laparoscopy becomes competitive or favorable where MIS infrastructure exists.

- High-resource settings:
  - Existing pediatric MIS programs
  - Low incremental cost for laparoscopy
  - Instrument reuse → minimal per-case cost
- Low-resource / rural settings:
  - Limited access to laparoscopy
  - High upfront costs (equipment, training)
  - Open repair more practical & cost-effective
- Global perspective:
  - Open repair remains widely used due to resource constraints
- Evidence from tertiary centers:
  - Small cost difference between techniques
- Key cost driver:
  - Avoiding repeat anesthesia & surgery
  - Favors laparoscopy, especially for bilateral hernias
- Overall:
  - Laparoscopy is economically competitive
  - Open repair slightly cheaper for simple unilateral cases

Parental Satisfaction and Cosmesis Cosmetic Results

Laparoscopic repair offers superior cosmetic outcomes, contributing to higher parent and patient satisfaction—especially in older children.

- Laparoscopic repair:
  - Small incisions (umbilical + tiny ports)
  - Scars often barely visible
- Open repair:
  - ~1–2 cm groin incision
  - Usually fades, but remains visible



- Evidence:
  - Parents & older children rate laparoscopic scars more favorably
    - Significantly higher scar satisfaction reported in multiple studies
- Clinical relevance:
  - Cosmetic benefit most important in older children & adolescents
- Overall:
  - Cosmesis is a clear advantage of laparoscopy
  - Often translates to higher parental satisfaction

Parental Satisfaction and Cosmesis
Parental Satisfaction and Recovery Experience

Parental satisfaction is high with both approaches; laparoscopy is often preferred, but communication and shared decision-making matter most.

- Overall satisfaction is high with both techniques
- Parents value:
  - Child's comfort
  - Hospital experience
  - Avoidance of additional procedures
- Day surgery studies:
  - Very high satisfaction regardless of technique
- Open vs laparoscopic:
  - Some studies show slight preference for laparoscopy
  - Reasons: faster recovery & less visible scar
- Additional reassurance:
  - Laparoscopy allows contralateral inspection, reducing anxiety about future hernia
- Key factor:
  - Shared decision-making & clear communication improve satisfaction (AAP)

Parental Satisfaction and Cosmesis Psychosocial and Other Factors

Parents value safety and success most; when outcomes are equivalent, the minimally invasive nature of laparoscopy is often preferred.

- Low long-term issues with both techniques
  - Chronic pain is very rare in children
  - No clear difference between approaches
- Rapid return to school or daycare with either repair
- Family preferences vary:
  - Some favor laparoscopy (less invasive, modern, less scarring)
  - Others trust open repair (traditional, simple, proven)
- Clinical tailoring:
  - Suspected bilateral disease → laparoscopy often preferred
  - Simple unilateral hernia → open repair remains attractive
- Key driver of satisfaction:
  - Successful, safe outcome, not the technique itself
- Overall trend:
  - When outcomes are equal, laparoscopy often receives more positive feedback from families

Take-Home Messages

- **Both open and laparoscopic repair are safe and effective** for pediatric inguinal hernia, with low recurrence and complication rates.
- **No single approach is universally superior**; the optimal technique should be individualized.
- **Laparoscopic repair offers advantages** in bilateral hernias, recurrent cases, contralateral evaluation, and cosmetic outcomes.
- **Open repair remains a reliable standard**, particularly in resource-limited settings.
- **Shared decision-making**, considering patient factors and surgeon expertise, is essential.

In pediatric inguinal hernia repair,
we are not choosing sides,
we are choosing what is best for the child.