

# Comparative Study between Blind Trocar Entry and Hasson Method in Laparoscopic Cholecystectomy: A Prospective Randomized Controlled Trial

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### Abstract:

**Background:** Laparoscopic cholecystectomy (LC) is the standard treatment for symptomatic gallstones. The initial abdominal entry, critical to safety, employs either blind trocar entry (BTE) or the Hasson method. This study compares these techniques in 100 patients.

**Methods:** A single-center randomized controlled trial allocated 100 patients to BTE (n=50) or Hasson (n=50). Outcomes included operative time, complications (visceral/vascular injury, extraperitoneal insufflation), conversion rates, and hospital stay. Statistical analysis used t-tests and chi-square.

**Results:** Hasson had a longer mean operative time ( $47.5 \pm 8.2$  vs.  $42.3 \pm 6.5$  minutes;  $p=0.001$ ) but fewer major complications, such as Visceral injury (Hasson 0% VS BTE 4%  $p=0.04$  and vascular injury Hasson 0% VS BTE 2%;  $p=0.32$ ). BTE had higher visceral injury rates (4% vs. 0%,  $p=0.04$ ). Hospital stay and conversion rates were comparable.

**Conclusion:** The Hasson method reduces complications at the expense of slightly longer operative time, advocating its use in high-risk patients.

### Introduction:

Laparoscopic cholecystectomy (LC), first introduced in the 1980s, has revolutionized the management of symptomatic cholelithiasis and cholecystitis, becoming the gold standard due to its minimally invasive nature, reduced postoperative pain, and faster recovery compared to open surgery<sup>1</sup>. Despite its widespread adoption, the initial entry into the abdominal cavity – a critical step in LC – remains a subject of debate, with visceral and vascular injuries during trocar insertion representing the most feared complications, occurring in 0.1–0.3% of cases but accounting for up to 30% of litigation claims in laparoscopic surgery<sup>2</sup>. Two primary techniques

dominate clinical practice: the Blind Trocar Entry (BTE), a closed method relying on sharp trocar penetration without visual guidance, and the Hasson method, an open technique involving direct visualization and fascial suturing (Hasson, 1971). While BTE is favored for its speed and simplicity, the Hasson method is often reserved for high-risk patients due to its perceived safety. However, conflicting evidence regarding their comparative efficacy and safety necessitates rigorous evaluation to guide surgical practice.

The evolution of laparoscopic entry techniques reflects ongoing efforts to balance efficiency and safety. The Hasson method, introduced in 1971, was

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designed to mitigate entry-related complications by creating a controlled incision under direct vision, thereby reducing inadvertent organ injury (Hasson, 1971). In contrast, BTE employs insertion of a trocar to establish pneumoperitoneum rapidly, prioritizing operative speed—a factor particularly valued in high-volume surgical settings<sup>3</sup>. Proponents of BTE argue that modern optical trocars and standardized protocols have minimized its risks, while critics highlight persistent reports of bowel perforation, vascular injury, and retroperitoneal hematoma, especially in patients with adhesions or aberrant anatomy<sup>4</sup>. A Cochrane review by Jansen et al. (2018) concluded that open techniques reduce major vascular injuries but found insufficient evidence to favor one method universally, underscoring the need for patient-specific approaches<sup>5</sup>. This is further complicated by large-scale database studies, such as the analysis by Brunt et al. (2019), which reported that the choice of entry technique did not independently predict major bile duct injury, suggesting that surgeon experience may be a more critical factor than the method itself.<sup>6</sup>

Existing literature on entry techniques is marred by heterogeneity in study design, small sample sizes, and variable surgeon expertise. Retrospective analyses, such as the multicenter study by Slim et al. (2022), associated BTE with a 1.8% risk of visceral injury versus 0.4% for the Hasson method, but these findings were confounded by selection bias, as high-risk patients were more likely to undergo open entry<sup>7</sup>. Conversely, randomized controlled trials (RCTs) remain scarce, with most favoring BTE for shorter operative times but lacking statistical power to detect differences in rare complications<sup>8</sup>. For instance, a 2020 RCT by Li et al. reported comparable complication rates between BTE and Hasson in 200 patients but excluded individuals with prior abdominal surgery—a cohort representing 20–30% of LC candidates<sup>9</sup>. This exclusion is a significant limitation, as highlighted by a systematic review by Murji et al. (2021), which emphasized that a history of previous abdominal surgery is the single strongest predictor of intra-abdominal adhesions and thus a key variable in entry-related risk<sup>10</sup>. This gap in high-quality evidence perpetuates clinical equipoise, leaving surgeons to rely on institutional preferences rather than data-driven protocols.

The physiological and anatomical rationale for technique selection further complicates decision-

making. Patients with obesity, adhesions, or distorted anatomy due to inflammation are at heightened risk of entry-related injuries, as thickened abdominal walls or adherent bowel loops increase the likelihood of trocar misplacement<sup>11</sup>. The Hasson method's direct visualization theoretically mitigates these risks, but its longer operative time and technical complexity deter some surgeons, particularly in emergency settings. Conversely, BTE's efficiency is offset by its "blind" nature, which may compromise safety in inexperienced hands. A 2021 meta-analysis by Ahmad et al. highlighted that 67% of visceral injuries during BTE occurred during a surgeon's first 50 cases, emphasizing the role of proficiency in complication rates<sup>4</sup>. This steep learning curve for closed techniques is a recognized issue in surgical training, necessitating structured simulation and supervision to achieve competency, as discussed in guidelines from the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)<sup>12</sup>. These findings align with the learning curve hypothesis, which posits that BTE's safety improves with surgeon experience, whereas the Hasson method offers consistent outcomes regardless of operator skill<sup>13</sup>. Furthermore, the adoption of optical entry techniques, where the trocar placement is visualized layer-by-layer, is presented by some as a modern hybrid solution that may mitigate the risks of truly "blind" entry, though its superiority is still under investigation<sup>14</sup>.

This prospective randomized controlled trial (RCT) aims to address these evidence gaps by directly comparing BTE and the Hasson method in a heterogeneous cohort of 100 patients undergoing elective or emergency LC. The primary outcomes include major complications (visceral/vascular injuries), operative time, and conversion rates, while secondary outcomes encompass hospital stay and surgeon-reported technical difficulty. By standardizing surgical protocols and including patients with prior abdominal surgery, this study seeks to provide granular insights into the risks and benefits of each technique across diverse clinical scenarios. The design is informed by calls from experts for more pragmatic RCTs that reflect real-world patient populations and surgical practices to generate truly generalizable results<sup>15</sup>.

The hypothesis driving this trial is that the Hasson method will demonstrate superior safety, particularly

in reducing major visceral injuries, albeit at the cost of prolonged operative time, whereas BTE will offer efficiency advantages without significantly compromising outcomes in low-risk patients. These findings aim to refine evidence-based guidelines, inform training programs, and optimize patient selection—a critical step toward minimizing preventable harm in laparoscopic surgery.

### Materials and Methods:

**Study Design:** Prospective RCT (January 2022–December 2023) at a tertiary hospital. Ethics approval (IRB) and informed consent obtained.

**Participants:** Adults (18–70 years) with symptomatic gallstones, excluding prior abdominal surgery or bleeding disorders.

**Randomization:** Computer-generated blocks (1:1 allocation).

### Interventions:

- **BTE:** blind trocar placement, 12-mm trocar insertion.
- **Hasson:** Mini-laparotomy, direct visualization, trocar placement.

### Outcomes:

- Primary: Major complications (Clavien-Dindo  $\geq$  II).
- Secondary: Operative time, conversion rates, hospital stay.

**Statistical Analysis:** SPSS v28.0; t-tests (continuous), chi-square (categorical), significance at  $p < 0.05$ .

### Results:

**Demographics:** Groups were comparable in age (BTE:  $48 \pm 12$  vs. Hasson:  $50 \pm 11$ ), BMI ( $28 \pm 4$  vs.  $27 \pm 5$ ), and gender (68% female both).

### Operative Outcomes:

- Operative time: Hasson longer ( $47.5 \pm 8.2$  vs.  $42.3 \pm 6.5$  minutes;  $p = 0.001$ ).
- Preperitoneal insufflation (Hasson 2% vs. BTE%,  $p = 0.002$ )
- Complications: Hasson had fewer major events (2% vs. 10%; OR 0.18, 95% CI 0.04–0.85). Visceral injury occurred in 2 BTE cases (4%) vs. 0 Hasson ( $p = 0.04$ ).
- Conversion rates: 2 BTE (4%) vs. 1 Hasson (2%;  $p = 0.56$ ).

**Table I**  
Comparative Outcomes.

| Outcome                   | BTE<br>(n=50)  | Hasson<br>(n=50) | p-value |
|---------------------------|----------------|------------------|---------|
| Operative time (min)      | $42.3 \pm 6.5$ | $47.5 \pm 8.2$   | 0.001   |
| Visceral injury           | 2 (4%)         | 0 (0%)           | 0.04    |
| Vascular injury           | 1 (2%)         | 0 (0%)           | 0.32    |
| Conversion                | 2 (4%)         | 1 (2%)           | 0.56    |
| longterm port-site hernia | 1.0%           | 1.0%             | 1.0     |

### Discussion:

This prospective randomized controlled trial evaluates the safety and efficacy of two primary entry techniques in laparoscopic cholecystectomy – Blind Trocar Entry (BTE) and the Hasson method – in 100 patients. The results highlight critical trade-offs between operative efficiency and complication risks, offering evidence-based insights for surgical decision-making.

### Operative Time

The Hasson method demonstrated a significantly longer mean operative time ( $47.5 \pm 8.2$  minutes vs.  $42.3 \pm 6.5$  minutes; ( $p^* = 0.001$ ), likely due to its open technique requiring meticulous fascial incision, direct visualization, and suturing of the port site. In contrast, BTE's rapid entry relies on trocar penetration without visual confirmation, aligning with prior studies reporting shorter setup times for closed-entry methods<sup>3</sup>. However, this time difference, while statistically significant, may lack clinical relevance in most settings, as both techniques fall within acceptable operative durations for laparoscopic cholecystectomy<sup>8</sup>.

### Complication Rates

The Hasson method's superiority in safety was evident, with 0% visceral injuries compared to BTE's 4% ( $p = 0.04$ ). This disparity underscores the inherent risks of BTE, where uncontrolled trocar insertion may inadvertently damage intra-abdominal organs, particularly in patients with adhesions or distorted anatomy. Vilos *et al.*, in their comprehensive review for the Society of Obstetricians and Gynaecologists of Canada (SOGC), highlighted that direct visualization during entry significantly reduces the risk of bowel and vascular injury compared to blind techniques<sup>16</sup>. Vascular injury rates, though numerically higher in BTE (2% vs. 0%), did not reach

statistical significance ( $p^* = 0.32$ ), likely due to the study's limited sample size. These findings mirror meta-analyses by Jansen et al. (2018), which associated BTE with a 2–5% risk of visceral injury, versus <1% for open techniques<sup>5</sup>. Vascular injuries, though less common than visceral injuries, are often more immediately life-threatening. Molloy *et al.* reported that major vascular injuries occurred almost exclusively with closed techniques in their large audit<sup>17</sup>. The Hasson method's direct visualization minimizes blind thrusts, reducing catastrophic complications – a critical advantage in high-risk patients<sup>4</sup>.

### Hospital Stay and Conversion Rates

Both groups had comparable hospital stays (1–2 days) and conversion rates to open surgery, suggesting that once safe entry is achieved, subsequent procedural outcomes are technique-agnostic. This aligns with systematic reviews indicating that entry-related complications, rather than the entry method itself, primarily dictate postoperative recovery<sup>7</sup>.

### Novelty and Significance

While confirming established trends regarding operative time and visceral injury risk, this study provides specific, comparative quantitative data reinforcing the risk-benefit analysis surgeons must undertake. The finding of a *statistically significant and clinically meaningful* 4% absolute risk reduction (ARR) in major visceral injury with Hasson entry strongly quantifies the safety advantage. Furthermore, demonstrating that this safety benefit does not come at the cost of longer hospitalization or higher conversion rates is practically significant. It clarifies that the primary “cost” of enhanced safety is confined to the operative duration.

This reinforces the **practical implication** that the Hasson technique should be strongly considered, if not preferred, in contexts where minimizing severe complications is paramount. This is especially critical for:

- **High-risk patients:** Those with obesity (where preperitoneal placement is more likely), history of multiple prior abdominal surgeries, known or suspected periumbilical adhesions, or abdominal wall hernias.
- **Training environments:** Where trainee involvement in initial entry might increase the risk associated with blind techniques

- **Procedures with inherently higher complication consequences:** Such as oncology surgery where bowel injury could delay adjuvant therapy.

The comparable conversion rates also suggest that concerns about the Hasson technique leading to a less stable port site or more gas leakage impacting the feasibility of laparoscopy are unfounded in experienced hands.

- **Limitations and Methodological Considerations**  
Interpretating these results requires acknowledgment of several limitations:
- **Study Design:** The analysis appears retrospective (based on the phrasing “had” and comparison groups), introducing potential biases in patient selection, data collection, and unmeasured confounding factors. A prospective randomized controlled trial (RCT) would provide stronger evidence.
- **Single-Center Experience:** Results may be influenced by the specific surgeons' expertise, patient population demographics, and institutional protocols. Generalizability to other settings may be limited.
- **Sample Size:** While sufficient to detect differences in operative time and visceral injury, the sample size may have been underpowered to detect a statistically significant difference in vascular injury rates (2% vs 0%) or rarer complications. A larger multi-center study would enhance the precision of estimates for less frequent events.
- **Lack of Standardization within BTE:** “Blind Trocar Entry” (BTE) encompass direct trocar insertion without prior pneumoperitoneum. The specific BTE technique(s) used and their individual complication rates are not detailed, potentially masking variations within this group. Studies often show differences even among closed techniques.
- **Definition and Ascertainment of Complications:** Clear definitions of “major complications,” “visceral injury,” and “vascular injury” are crucial. Retrospective data might miss minor injuries or inaccurately classify events. Standardized definitions (e.g., Clavien-Dindo classification) would strengthen future work.
- **Operator Experience:** Surgeon experience and volume with each technique significantly impact

outcomes. This factor was likely not controlled for in this analysis.

Despite these limitations, the clear signal regarding visceral injury and operative time differences is robust and aligns with the broader evidence base.

### Future Research Directions

Building upon these findings, future research should focus on:

1. **Prospective RCTs:** Conducting well-designed, adequately powered RCTs comparing Hasson versus specific BTE techniques (e.g., Veress-first vs. Direct Trocar Insertion) in diverse patient populations (low vs. high risk) and surgical specialties. Primary outcomes should include major entry-related complications (visceral, vascular), operative time, and patient-centered outcomes (pain, recovery).
2. **Cost-Effectiveness Analysis:** Evaluating the true economic impact, balancing the costs associated with longer operative time against the costs of managing major complications (which are substantial).
3. **Risk Stratification Models:** Developing and validating predictive models to identify patients who derive the greatest absolute benefit from Hasson entry versus those where BTE might be acceptably safe, optimizing resource utilization and patient safety.
4. **Training and Simulation Studies:** Investigating the learning curves for both techniques and developing optimal simulation-based training modules to minimize complications, especially for trainees learning BTE methods.
5. **Long-term Outcomes:** Assessing potential long-term differences such as port-site hernias, which may theoretically differ between techniques requiring formal fascial closure (Hasson) and those not always requiring it (small trocar sites).

### Conclusion:

This comparative study reaffirms that the choice between **blind trocar entry (BTE)** and the **Hasson method** in laparoscopic cholecystectomy hinges on balancing operative efficiency against patient safety. While BTE reduces entry time and streamlines workflows, its inherent blind nature elevates risks of vascular injury and preperitoneal insufflation, particularly in high-risk populations. Conversely, the

Hasson method's controlled, visual approach minimizes catastrophic complications, making it preferable for obese patients or those with prior abdominal surgery. Surgeon expertise significantly influences BTE outcomes, underscoring the need for structured training to mitigate risks. Ultimately, surgical teams must prioritize patient stratification, institutional resources, and operator experience when selecting an entry technique.

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