

Transabdominal Pre-peritoneal (TAPP) vs totally extraperitoneal (TEP) laparoscopic techniques for inguinal hernia repair

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Background

The choice of approach to the laparoscopic repair of inguinal hernia is controversial. The most commonly used laparoscopic techniques or inguinal hernia repair are transabdominal preperitoneal (TAPP) repair and totally extraperitoneal (TEP) repair. TAPP requires access to the peritoneal cavity with placement of a mesh through a peritoneal incision. This mesh is placed in the preperitoneal space covering all potential hernia sites in the inguinal region. The peritoneum is then closed above the mesh leaving it between the preperitoneal tissues and the abdominal wall where it becomes incorporated by fibrous tissue. TEP repair was first reported in 1993 (Ferzli 1993), TEP is different in that the peritoneal cavity is not entered and mesh is used to seal the hernia from outside the peritoneum. This approach is considered to be more difficult than TAPP but may lessen the risks of damage to the internal organs and of adhesion formation leading to intestinal obstruction, which has been linked to TAPP.

Indirect comparisons between TAPP and TEP have raised questions about whether the two procedures do perform differently for some outcomes such as recurrence. Very large randomized controlled trials such as those conducted by the MRC Laparoscopic Groin Hernia Group and Neumayer and colleagues, both of which compared a predominantly TEP arm with open repair, suggested that TEP has a higher risk of recurrence than open mesh repair. However, a systematic review comparing laparoscopic with open mesh repair found no evidence of a difference in recurrence rates between TAPP and open mesh repair (McCormack 2003; McCormack NICE 2004). While any conclusions drawn on such indirect comparisons should be treated with caution they do raise questions that can only be satisfactorily addressed by well designed studies and systematic reviews of such studies that directly compare TAPP with TEP.

There is a scarcity of data directly comparing laparoscopic TAPP and laparoscopic TEP and questions remain about their relative merits and risks. In light of this, the review aims to compare TAPP and TEP directly in order to determine which method is associated with better outcomes, in particular, serious adverse events and subsequent potential consequences such as persisting pain.

Objectives

The purpose of this review was to compare the clinical effectiveness and relative efficiency of laparoscopic TAPP and laparoscopic TEP for inguinal hernia repair.

Criteria for considering studies for this review

Type of studies

All published and unpublished randomized controlled trials and quasi-randomized controlled trials comparing laparoscopic TAPP with laparoscopic TEP were eligible for inclusion.

Type of Participants

Relevant participants are adult patients requiring surgery for repair of inguinal hernia (direct and indirect), children (particularly under the age of 12) were not included.

Types of intervention

Laparoscopic methods of surgical repair of inguinal hernia:

a) Laparoscopic TAPP

b) Laparoscopic TEP

Types of outcome measures

Primary outcomes:

Serious adverse events (including visceral injuries and vascular injuries)

Persisting pain

Hernia recurrence

Secondary outcomes:

Duration of operation (min)

Opposite method initiated

Conversion

Haematoma

Seroma

Wound/Superficial Infection

Mesh/Deep Infection

Port site hernia

Length of hospital stay (Days)

Time to return to usual activities (Days)

Persisting numbness

Quality of Life

Health service resource use and costs

Search methods for identification of studies

The following search strategy was used to identify studies indexed in Medline. Since the first reported use of a prosthetic mesh in laparoscopic repair was in 1991 and TEP was not reported until 1992, searches were limited to 1990 to present.

1.hernia inguinal

2.(inguinal or groin).

3.hernioplasty.

4.herniorrhaphy.

5.(hernia adj3 repair

6.tapp.

7.tep

8.extraperitoneal.tw

This strategy was adapted for use in other electronic databases. These were Medline Extra (June 13th 2003), Embase (1990-Week 23, 2003), Biosis (1990-18th June 2003), Science Citation Index (1991-21st June 2003), Cochrane Central Register of Controlled Trials (Issue 2, 2003),

Journals@ Ovid Full Text (25th July 2003) and the electronic version of the journal, Surgical Endoscopy (1996- June 2003). Only selected journals were searched in the Journals@ Ovid Full Text : Annals of Surgery 1996 - July 2003, Archives of Surgery 1995 - June 2003, British Journal of Surgery and Supplements 1995 - June 2003 and Surgical Laparoscopy 1996 - June 2003.

Recent conference proceedings by the following organisations were hand searched:

Association of Endoscopic Surgeons of Great Britain & Ireland (1999-2003)
International Congress of the European Association for Endoscopic Surgery (2000-2002)
Scientific Session of the Society of American Gastrointestinal & Endoscopic Surgeons (SAGES) (2001-2003)
Italian Society of Endoscopic Surgery

In addition, specialists involved in research on the repair of inguinal hernia were contacted to ask for information about any further completed and ongoing trials, relevant websites were searched and reference lists of the all included studies were checked for additional report.

It is widely accepted that a learning effect exists for laparoscopic repair and particularly for the more complex TEP repair. This is an important consideration and therefore a separate search was carried out on MEDLINE, EMBASE and Science Citation Index databases to identify any papers reporting learning curves for TAPP and TEP.

Description of studies

Number and type of studies included

Only one randomised controlled trial ([Schrenk 1996](#)) was available and reported outcomes on operation time, intra-operative and postoperative complications, length of hospital stay, time to return to work, time to return to usual activities and hernia recurrence. Five studies with concurrent comparators were identified ([Cohen 1998](#), [Felix 1995](#), [Khoury 1995](#), [Lepere 2000](#), [Van Hee 1998](#)); one with a non-concurrent comparator ([Weiser 2000](#)); and three studies ([Baca 2000](#), [Leibl 2000](#), [Tamme 2003](#)) were case series (TEP, 5203 hernia repairs ([Tamme 2003](#)) and TAPP, 2500 ([Baca 2000](#)) and 5203 ([Leibl 2000](#)) hernia repairs respectively). Details of these studies can be found in the Characteristics of included studies.

Number and type of randomised studies excluded, with reasons for specific exclusions

This search strategy was used in conjunction with another review. The combined number and types of randomised studies excluded, with reasons for specific exclusions are reported in McCormack 2004.

Number and type of non-randomised studies excluded, with reasons for specific exclusions

18 articles were obtained but were excluded because they failed to meet one or more of the specified inclusion criteria in terms of study design, participants, interventions, or outcomes. Of the 18 articles excluded, six were non-concurrent comparative studies with less than 500 participants, four were case-series with less than 1000 participants, four studies were retrospective, 3 studies only provided the overall results for TAPP/TEP, and one study only provided descriptive information for the techniques.

Methodological quality

Only one randomised controlled trial ([Schrenk 1996](#)) was eligible for inclusion. The concealment of allocation was by sealed envelope and there were no losses to follow-up. However, it was unclear if the outcome assessor was blinded or if analysis was by intention-to-treat. The mean duration of follow-up was 3 months, hernia diagnosis was confirmed by clinical examination and the operation was reported to have been performed by an 'experienced' surgeon.

Results

Randomised Controlled Trials

The results are tabulated in Additional Table 01 ([Table 01](#)).

1. Duration of operation (minutes)

The operating time was slightly longer in TEP than TAPP, however the difference was not statistically significant (Comparison 03:01: WMD -6.30 minutes, 95% CI -12.82 to 0.22; $p=0.06$).

2. Haematoma

There was only one haematoma recorded in the study and this was in the TAPP group (Comparison 03:04: RR 2.59, 95% CI 0.11 to 60.69; $p=0.6$).

3. Length of stay (days)

Length of stay was shorter in the TEP group (Comparison 03:11: WMD -0.70 days, 95% CI -1.33 to -0.07; $p=0.03$).

4. Time to return to usual activity (days)

An overall figure for time to return to usual activities was not given in the paper, however several separate activities were listed. Of all of those listed there were no statistically significant differences between the TAPP and TEP groups.

5. Hernia recurrence

Hernia recurrence was only assessed up to three months. Within this time there was one recurrence in the TAPP group (Comparison 03:15: RR 2.59, 95% CI 0.11 to 60.69; $p=0.6$).

6. Vascular injury

Seven studies reported vascular injuries) including three large case series. In the comparative studies, three reported no vascular injuries whilst one reported a higher rate (3% versus 0%) in TEP, however this was only a small study of 120 patients ([Khouri 1995](#)). In the three case series, one reported no vascular injuries in TAPP ([Baca 2000](#)) while the rates from the other two case series showed similar rates for TAPP (0.5%, based on 5707 cases) ([Leibl 2000](#)) and TEP (0.47% based on 5203 cases) ([Tamme 2003](#)).

7. Visceral injury

Seven studies reported visceral injuries ([Baca 2000](#), [Cohen 1998](#), [Felix 1995](#), [Khouri 1995](#), [Leibl 2000](#), [Tamme 2003](#), [Van Hee 1998](#)) including the three large case series ([Baca 2000](#), [Leibl 2000](#), [Tamme 2003](#)). In the comparative studies, two reported no visceral injuries ([Khouri 1995](#), [Van Hee 1998](#)) whilst two reported a higher rate (0.9% versus 0% and 0.4% versus 0%) in TAPP than in TEP ([Cohen 1998](#), [Felix 1995](#)). The combined number of cases in these studies was 1323. In the three case series, the two TAPP series ([Baca 2000](#), [Leibl 2000](#)) reported similar rates of 0.64% and 0.6% with a combined case number of 8207 whilst the one TEP series

reported a lower rate of 0.23% based on 5203 cases ([Tamme 2003](#)).

8.Mesh/deep infection

Deep infections, primarily mesh infections, are potentially more serious than superficial infections and can result in removal of the mesh. These were reported in seven studies ([Baca 2000](#), [Felix 1995](#), [Khoury 1995](#), [Leibl 2000](#), [Tamme 2003](#), [Van Hee 1998](#), [Weiser 2000](#)). In the comparative studies, three reported no deep infections ([Felix 1995](#), [Khoury 1995](#), [Van Hee 1998](#)) whilst one reported rates of 0.2% and 0% for TAPP and TEP respectively ([Weiser 2000](#)). Rates for TAPP were low in the two case series ([Baca 2000](#), [Leibl 2000](#)) i.e. 0% and 0.1%. The rate in TEP was again low, 0.02%, and did not indicate a difference between TAPP and TEP ([Tamme 2003](#)).

9.Port-site hernia

Eight of the nine studies reported port-site hernia ([Baca 2000](#), [Cohen 1998](#), [Felix 1995](#), [Khoury 1995](#), [Leibl 2000](#), [Tamme 2003](#), [Van Hee 1998](#), [Weiser 2000](#)). The comparative studies showed rates of 0% to 3.7% ([Cohen 1998](#), [Felix 1995](#), [Khoury 1995](#), [Van Hee 1998](#), [Weiser 2000](#)). In all four studies where cases of port-site hernia were reported, TAPP was associated with a higher rate than TEP ([Cohen 1998](#), [Felix 1995](#), [Khoury 1995](#), [Weiser 2000](#)). In three studies there were no cases of port site hernia reported in the TEP groups compared to 3.7% ([Cohen 1998](#)), 0.8% ([Felix 1995](#)) and 1.7% ([Khoury 1995](#)) in the TAPP groups. This trend was also seen in the case series where there were no reported cases of port-site hernia amongst 5203 TEP repairs ([Tamme 2003](#)) compared to 0.24% ([Baca 2000](#)) and 0.35% ([Leibl 2000](#)) amongst 8207 TAPP repairs.

10.Conversions

The conversion rate was reported in six of the studies ([Baca 2000](#), [Cohen 1998](#), [Felix 1995](#), [Khoury 1995](#), [Tamme 2003](#), [Van Hee 1998](#)). In three of the four comparative studies the rate was higher in the TEP group, with rates of 0% versus 4% ([Cohen 1998](#)), 0% versus 1.8% ([Felix 1995](#)) and 5% versus 7% ([Van Hee 1998](#)). The fourth comparative study was small with only 120 procedures and had no conversions ([Khoury 1995](#)). However in the large case series the conversion rates between TAPP and TEP were very similar at 0.24% ([Baca 2000](#)) and 0.23% ([Tamme 2003](#)) respectively.

Discussion

When considering the comparison of TAPP with TEP, only one small randomised trial ([Schrenk 1996](#)) met the inclusion criteria. There appeared to be no differences between TAPP and TEP in terms of length of operation, haematomas, time to return to usual activities and hernia recurrence, but confidence intervals were all wide.

The data about complications from the additional non-RCT studies of TAPP and TEP suggest that an increased number of port-site hernias and visceral injuries are associated with TAPP rather than TEP whilst there appear to be more conversions with TEP. These results appear to be broadly consistent regardless of the evidence source. Vascular injuries and deep/mesh infections were very rare and there was no obvious difference between the groups, the numbers being too small to draw any conclusions.

Although it appears that it may take between 30 and 100 procedures to become expert and that generally the operation time for TAPP is less for both experienced and inexperienced operators the data may be biased as it is possible that surgeons performing TEP are already experienced in

TAPP.

Conclusions

There is insufficient data to allow conclusions to be drawn about the relative effectiveness of TEP compared with TAPP. Efforts should be made to start and complete adequately powered RCTs, which compare the different methods of laparoscopic repair.

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