British Journal of Anaesthesia **111** (5): 721–35 (2013)
Advance Access publication 27 June 2013 · doi:10.1093/bja/aet214

BJA

Duration of analgesic effectiveness after the posterior and lateral transversus abdominis plane block techniques for transverse lower abdominal incisions: a meta-analysis

F. W. Abdallah[1,2]*, J. G. Laffey[1,2], S. H. Halpern[1,3] and R. Brull[1,4,5]

[1] Department of Anesthesia, University of Toronto, ON, Canada
[2] Department of Anesthesia and Keenan Research Centre, Li Ka Shing Knowledge Institute, St Michael's Hospital, Toronto, ON, Canada
[3] Department of Anesthesia, Sunnybrook Hospital, Toronto, ON, Canada
[4] Department of Anesthesia, Women's College Hospital, Toronto, ON, Canada
[5] Department of Anesthesia, Toronto Western Hospital, Toronto, ON, Canada

* Corresponding author: Department of Anaesthesia, St Michael's Hospital, 30 Bond Street, Toronto, ON, Canada M5B 1W8.
E-mail: abdallahf@smh.ca

Editor's key points

- The duration of effectiveness of transversus abdominis plane (TAP) block in providing postoperative analgesia after abdominal surgery was studied in this meta-analysis.
- The authors conclude that TAP block using the posterior approach reduced the rest and dynamic pain as well as the consumption of morphine for up to 48 h.
- The effect was not seen when a TAP block was performed using the lateral approach.
- The authors call for randomized controlled trials, which will compare the two approaches of performing a TAP block.

Background. Both posterior and lateral transversus abdominis plane (TAP) block techniques provide effective early (0–12 h) postoperative analgesia after transverse incision surgery. However, whether either technique produces prolonged analgesia lasting beyond 12 h remains controversial. This meta-analysis examines the duration of analgesia associated with posterior and lateral TAP blocks in the first 48 h after lower abdominal transverse incision surgery.

Methods. We retrieved randomized controlled trials (RCTs) investigating the analgesic effects of TAP block compared with control in patients undergoing lower abdominal transverse incision surgery. Outcomes sought included interval postoperative i.v. morphine consumption and also rest and dynamic pain scores at 12, 24, 36, and 48 h postoperatively. Opioid-related side-effects and patient satisfaction at 24 and 48 h were also assessed. The 12–24 h interval morphine consumption was designated as a primary outcome.

Results. Twelve RCTs including 641 patients were analysed. Four trials examined the posterior technique and eight assessed the lateral technique. Compared with control, the posterior TAP block reduced postoperative morphine consumption during the 12–24 h and 24–48 h intervals by 9.1 mg (95% CI: −16.83, −1.45; P=0.02) and 5 mg (95% CI: −9.54, −0.52; P=0.03), respectively. It also reduced rest pain scores at 24, 36, and 48 h, and also dynamic pain scores at 12, 24, 36, and 48 h. Differences were not significant with the lateral TAP block.

Conclusion. Based on the comparisons with control, the posterior TAP block appears to produce more prolonged analgesia than the lateral TAP block. Future RCTs comparing these two techniques are required to confirm our findings.

Keywords: acute pain, novel techniques; anaesthetic blocks, regional; analgesia, postoperative; regional blockade; surgery, abdominal

Accepted for publication: 17 April 2013

Patients undergoing obstetric or gynaecological surgery using transverse lower abdominal incisions, such as the Pfannenstiel, Cherney, and Maylard[1 2] incisions, often suffer severe pain during the first 48 h postoperatively.[3–5] Not surprisingly, the incidence of persistent postoperative pain, an undesirable outcome of surgery influenced by the duration and efficacy of postoperative analgesia,[6] after Caesarean delivery[7] and total abdominal hysterectomy[8] approaches 12 and 32%, respectively. As the abdominal wall is a major contributor to acute postoperative pain after abdominal surgery,[9] field blocks like the transversus abdominis plane (TAP) block[10] can provide effective analgesia for a variety of abdominal surgical procedures.[11 12] However, the relative efficacy of the TAP block for transverse lower abdominal incisions may vary depending on the block technique.[12] While posterior injections in the triangle of Petit and lateral injections at the midaxillary line techniques have both demonstrated efficacy in the immediate postoperative period,[12] the potential for either technique to produce more prolonged analgesic benefits (≥12 h) after lower transverse incision surgery remains controversial. A recent retrospective review[13]

suggests that prolonged post-Caesarean delivery analgesia lasting into the 24–48 h postsurgical period can be achieved by performing the lateral TAP block technique. In contrast, several clinical trials[14–16] and a recent qualitative systematic review[12] suggest that only the posterior TAP block technique provides prolonged analgesia. This meta-analysis examines the effect of each TAP block technique on analgesic outcomes in the first 48 h after laparotomy surgeries with a lower abdominal transverse incision.

Methods

The authors abided by the PRISMA guidelines[17] in the preparation of this review. We used a pre-determined protocol to review and evaluate the results of randomized controlled trials (RCTs) that measured the duration of analgesic effectiveness of the TAP block.

Eligibility criteria

We sought and retrieved full reports of RCTs that investigated the effects of TAP block (TAP group) compared with placebo or systemic analgesia (control group) on analgesic outcomes in patients undergoing abdominal surgery using a lower abdominal transverse incision.

Literature search

The US National Library of Medicine database, MEDLINE; the Excerpta Medica database, Embase; Cochrane Database of Systematic Reviews; and Cochrane Central Register of Controlled Trials databases were searched by two of the authors (F.W.A. and R.B.) independently. The search terms TAP/TAP block/Transversus Abdominis/Transverse Abdominis/Transversus Abdominis Plane block/and Transverse Abdominis Plane block alone and coupled with the search keywords 'lateral' and 'posterior' were queried. The results of the search were combined by the Boolean operator AND with medical subject headings analgesia/pain relief/pain control/pain prevention/and pain management and with the medical subject headings abdomen/abdominal wall/abdominal muscles/abdominal surgery/and abdominal incision. We also hand searched the bibliographies of included articles for additional RCTs that met the inclusion criteria. The search was limited to RCTs on human subjects published between January 2005 and December 2012; no language restrictions were imposed. RCTs were excluded if analgesic outcomes were not assessed, if surgeries other than lower abdominal transverse incision were performed, if unilateral or continuous TAP blocks were performed, or if adjuvants that may prolong the duration of nerve block analgesia were used. Trials examining the subcostal TAP block technique were not included as it does not provide analgesia for lower abdominal transverse incisions.[18] The decision on inclusion of qualifying studies in the review was obtained by consensus between two of the authors (F.W.A. and R.B.).

Data collection and presentation

Two of the authors (F.W.A. and R.B.) independently assessed the quality of the reviewed RCTs using the Jadad score,[19] and a final score was designated by consensus. An RCT was considered to be of good quality if the methodological score was between 3 and 5. As an additional indicator of quality, only trials with a sample size >10 per group and that maintained a concealed assignment were considered. For the purpose of this review, we evaluated interval opioid analgesic consumption (converted to i.v. morphine equivalent)[20] and also pain severity at rest and with movement [visual analogue scale (VAS), a 100 mm scale where 0 represents no pain and 100 represents maximum pain] at 12, 24, 36, and 48 h postoperatively. We also assessed the incidence of opioid-related adverse effects (postoperative nausea and vomiting, pruritus, and excessive sedation) and patient satisfaction at 24 and 48 h. The 12–24 h interval postoperative cumulative morphine consumption was designated as a primary outcome; and other outcomes were classified as secondary. The authors independently used a standardized data collection form to extract data; any discrepancies were resolved by re-examination of the source data.

Meta-analysis

Two of the authors (F.W.A. and R.B.) entered and cross-checked the data into the statistical programme. Meta-analytic techniques (Revman 5.1, Cochrane Library, Oxford, UK) were used to combine the data where possible. The random effect modelling was utilized in analysing both dichotomous and continuous data. Data from trials with more than two intervention groups receiving TAP block were combined into a single group as recommended by the Cochrane Handbook.[21] We calculated the odds ratio (OR) and 95% confidence interval (CI) for the dichotomous outcomes, and the standardized mean difference and 95% CI for the continuous outcomes. Differences were considered statistically significant if the 95% CI of OR excluded 1, or if the 95% CI excluded 0 for the standardized mean difference. We verified the extent of heterogeneity using the I^2 statistic.[22]

As prolonged analgesia has been attributed to the posterior technique,[14–16] we hypothesized—*a priori*—that combining the results of trials using the posterior and lateral techniques would generate significant heterogeneity among the pooled trials. We, therefore, performed subgroup analysis according to the TAP block technique.

Additional confounding factors that were identified *pre hoc* as potential sources of heterogeneity included differences in the population studied (pregnant or non-pregnant), and the use of intrathecal morphine in some trials. When data relating to the primary outcome (i.e. 12–24 h interval postoperative cumulative morphine consumption) were heterogeneous, we explored whether alternative subgrouping based on these pre-determined factors influenced the level of heterogeneity and significance of the treatment effects.

Results

Our search retrieved 29 articles, 12 of which met the inclusion criteria.[14 15 23–32] Figure 1 summarizes the retrieved, excluded, and reviewed RCTs. The median and range of the methodological quality score[19] of the 12 trials were 5 (3–5); and they included a total of 641 patients for analysis: 329 patients in