OBSTETRICS

Suture versus staples for skin closure after cesarean: a metaanalysis

Awathif Dhanya Mackeen, MD, MPH; Meike Schuster, DO; Vincenzo Berghella, MD

OBJECTIVE: We sought to perform a metaanalysis to synthesize randomized clinical trials of cesarean skin closure by subcuticular absorbable suture vs metal staples for the outcomes of wound complications, pain perception, patient satisfaction, cosmesis, and operating time.

STUDY DESIGN: A systematic search was performed using MEDLINE, Cochrane Databases, and ClinicalTrials.gov registries. We included randomized trials comparing absorbable suture vs metal staples for cesarean skin closure. Data were abstracted regarding wound complications, patient pain perception, patient satisfaction, cosmesis as assessed by the physician and patient, and operating time.

RESULTS: Twelve randomized trials with data for the primary outcome on 3112 women were identified. Women whose incisions were closed with suture were significantly less likely to have wound complications than those closed with staples (risk ratio, 0.49; 95% confidence interval [CI], 0.28—0.87). This difference remained significant even when wound complications were stratified by obesity. The decrease in wound complications was largely due to the lower incidence of wound separations in those closed with suture (risk ratio, 0.29; 95% CI, 0.20—0.43), as there were no significant differences in infection, hematoma, seroma, or readmission. There were also no significant differences in pain perception, patient satisfaction, and cosmetic assessments between the groups. Operating time was approximately 7 minutes longer in those closed with suture (95% CI, 3.10—11.31).

CONCLUSION: For patients undergoing cesarean, closure of the transverse skin incision with suture significantly decreases wound morbidity, specifically wound separation, without significant differences in pain, patient satisfaction, or cosmesis. Suture placement does take 7 minutes longer than staples.

Key words: cesarean, incision closure, staples, suture, wound complications

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Cesarean is one of the most common surgeries performed worldwide and rates are increasing despite efforts to the contrary.[1] Many of the surgical steps have been individually assessed previously, eg, prophylactic antibiotic administration, development of the bladder flap, techniques for expansion of the uterine incision and removal of the placenta, closure of the uterine and fascial incisions, closure of the subcutaneous space when $\geq$2 cm, and closure of the skin incision.[1,2] Our previous systematic review as well as Dahlke et al[1] concluded that the data remain conflicting with regards to whether it is better to close the cesarean skin incision with suture or with staples.[3]

Though optimizing the individual steps of a cesarean is important with respect to providing the best possible care for patients, the skin incision is the visible reminder to a patient about her cesarean. Despite the potential complexity of the surgery, the occurrence of a wound complication may be the aspect that the patient most clearly recalls. In addition, wound complications may result in prolonged hospital stay, readmission, increased time away from work, decreased infant bonding time, and increased health care expenditures.

Choice of closure continues to vary among clinicians, most commonly between absorbable subcuticular suture and nonabsorbable metal staples.[4] Additional evidence, including a trial recently published by 2 authors of this metaanalysis, has emerged regarding the optimal closure of the cesarean skin incision.[5] As such our goal was to examine the pertinent randomized clinical trials (RCTs) to evaluate the incidence of wound complications, pain perception, patient satisfaction, cosmesis, and operating time when the cesarean skin incision was closed with suture vs with staples.

From the Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, Geisinger Medical Center, Danville (Drs Mackeen and Schuster), and Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, Sidney Kimmel Medical College at Thomas Jefferson University, Philadelphia (Dr Berghella), PA.

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Corresponding author: Awathif Dhanya Mackeen, MD, MPH. admackeen@geisinger.edu

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MATERIALS AND METHODS

Sources

The principles embodied in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement were used in compiling this metaanalysis.[5] MEDLINE via Ovid and PubMed searches were performed in July 2014 to encompass the past 50 years of trials; additionally the Cochrane Databases were searched and clinical trials were identified using Ovid and Clinical Key and by searching ClinicalTrials.gov. Ovid MEDLINE was searched using Medical Subject Headings (MeSH) without restrictions for text words or word variations for the following search terms: "cesarean," "caesarean," "suture," "suture techniques," "stitches," "staple," "surgical stapling," "skin," "closure," "wound complications," "wound infection," "wound healing," "wound closure," "cicatrix," "scar," "randomized controlled trial," and "randomized clinical trial." "Humans" was set as the only limit. A second search was conducted in PubMed to identify nonindexed citations using the search terms "caesarean," "cesarean," "skin," "wound complications," "wound healing," "wound infection," "surgical wound infection," "staple," "suture," "stitches," and "trial." There were no language restrictions applied. Searches were performed by a health sciences library specialist, a reference librarian, and the primary author (A.D.M.). This search was conducted as a brand new search and not part of the original Cochrane review or RCT by this author. As this is a metaanalysis, it was considered exempt from institutional review board approval.

Study selection

All identified abstracts were independently reviewed by the primary author (A.D.M.) and an additional author (V.B. or M.S.) and full articles were retrieved and reviewed for trials considered for inclusion. The primary author and additional author independently reviewed the manuscripts to assess for inclusion or exclusion criteria for this metaanalysis. We included only RCTs comparing subcuticular absorbable suture with nonabsorbable metal staples for cesarean skin closure. We chose to exclude RCTs that compared absorbable staples, nonabsorbable suture, or stapling devices (Figure 1). We excluded ongoing trials; studies that assessed surgical techniques for cesarean, but not the skin incision; and studies that did not provide applicable data for inclusion in the metaanalysis (eg, abstracts that did not report sample size).

Study outcomes

The primary outcome was wound complications. This was defined as a composite of wound infection, separation, hematoma, seroma, or readmission secondary to a wound concern. These were defined as per the individual trials. Secondary outcomes were patient pain perception at discharge, patient satisfaction at 2 months postoperatively, cosmesis as assessed by the physician and patient at 2 months postoperatively, and operative time. Patient pain perception and satisfaction were collated among studies if a 10-point scale was used, typically the visual analog scale in which higher scores represent higher patient satisfaction and more pain.[6] Cosmesis was assessed if studies used the validated Physician Observer Scar Assessment Scale (OSAS) for assessment; this scale has both subjective (Physician Scar Assessment Scale [PSAS]) and objective (OSAS) components as scored by the patient and physician, respectively.[7] Patient assessment of cosmesis (PSAS) was scored from 6-60 and physician assessment of cosmesis (OSAS) was scored from 5-50: lower scores are considered superior.

When applicable, attempts were made to contact authors to obtain more detail on outcomes not clearly reported in the manuscript. Additionally we analyzed the primary outcome stratified by body mass index (<30 kg/m^2 [nonobese] vs ≥ 30 kg/m^2 [obese]).

Risk of bias assessment

Each of the individual manuscripts was independently reviewed by the primary author and 1 additional author, both of whom assigned a low, high, or unclear risk of bias for all studies for the following 6 categories: (1) random sequence generation, (2) allocation concealment, (3) blinding of outcome assessment, (4) incomplete outcome data, (5) selective reporting, and (6) other bias (any bias that did not fit into categories 1-5). We investigated publication bias using a funnel plot that we assessed visually.

Statistical analysis

Data from included studies were entered into software (Review Manager [RevMan], version 5.2; The Cochrane Collaboration, Copenhagen, Denmark). Summary risk ratios (RRs) with 95% confidence intervals (CIs) were calculated for categorical variables (Figures 2-5 and Appendix: Supplemental Figures 1-3); the weighted mean differences (MD) with 95% CI were computed for continuous variables (Supplemental Figures 4-8). The χ^2 test for heterogeneity was used to assess for statistical heterogeneity along with the I^2, which reflects the magnitude of heterogeneity. If it was reasonable to assume that the studies were similar with respect to the trials' methods and sample and χ^2 test for heterogeneity P value was $\geq .10$, we applied fixed effects analyses. However, if substantial heterogeneity was present (ie, χ^2 P value $< .10$), random effects analyses were applied. Tau^2, χ^2, and I^2 statistics are reported in all figures for reference, as descriptors of heterogeneity. The P value for overall effect is also presented and is considered significant if $< .05$. We did not perform any additional analyses (eg, sensitivity or subgroup analysis) secondary to the desire to include as many data as possible for the primary outcome.

RESULTS

After removal of duplicates, ongoing trials, non-RCTs, and RCTs that did not compare only absorbable suture vs nonabsorbable staples for cesarean skin closure, 12 studies were included in our analysis (Figure 1)[5,8-18]; data on 3112 women were available for the primary outcome. Of those 12 articles, 6 had not been included in previous systematic reviews. Two of the trials include cesareans performed via vertical skin