Prophylactic subcutaneous drainage for prevention of wound complications after cesarean delivery—a metaanalysis

Elizabeth K. Hellums, MD; Monique G. Lin, MD; Patrick S. Ramsey, MD, MSPH

A systematic literature review and meta-analysis of published data evaluating the effectiveness of prophylactic subcutaneous drainage to prevent wound complications in women undergoing cesarean delivery was performed. We identified 6 randomized trials of prophylactic subcutaneous drainage after cesarean delivery. Meta-analysis was performed and Peto odds ratios were calculated for each study outcome. The use of prophylactic subcutaneous drainage was not associated with a reduction in the rate of wound disruption (odds ratio 0.74, 95% CI: 0.39-1.42, $P = .36$, infection (odds ratio 1.15, 95% CI: 0.70-1.90, $P = .58$), hematoma (odds ratio 1.05, 95% CI: 0.33-3.30, $P = .94$), or seroma (odds ratio 0.44, 95% CI: 0.14-1.43, $P = .17$) when compared with women who were not receiving subcutaneous drainage. Prophylactic use of subcutaneous drainage does not prevent significant wound complications after cesarean delivery.

Key words: cesarean, subcutaneous drainage, wound complications

In an era where the rate of cesarean delivery and obesity are on the rise, delineation of optimal surgical techniques to minimize complications from cesarean delivery is of great clinical importance.[1] The rate of cesarean delivery in the United States has increased significantly over the past decade with the current rate of cesarean delivery in the United States 29.1%.[1] Depending on the population studied, approximately 3-30% of women undergoing cesarean delivery had wound complications develop postoperatively.[2] Risk factors for wound complications include maternal obesity, diabetes, prolonged labor with multiple vaginal examinations, the use of internal monitors, and infections, such as chorioamnionitis.[3]

In particular, obese gravid women are at very high risk for wound complications. The rate of diabetes and cesarean delivery are increased in this population.[4,5] Moreover, increased subcutaneous thickness has been shown to be an independent risk factor for development of postcesarean wound complications.[6] Thus, as the incidence of obesity rises, not only does it contribute to the increase in cesarean delivery, but postcesarean wound complications, including infections, seromas, dehiscence, and hematomas are becoming more prevalent.[3,6-8]

Many techniques have been investigated to decrease wound complications, including perioperative antibiotic prophylaxis, skin preparation techniques, subcutaneous suture closure, and subcutaneous drainage.[3] The premise behind these techniques is to reduce the presence of bacteria and decrease the amount of subcutaneous tissue dead space. This potential space can be a focal point for collection of serous fluid or blood, which can become infected and ultimately culminate in wound disruption.

Surgical drains are often used therapeutically in the presence of gross purulence, bleeding, or excessive lymph drainage.[3,9] The use of prophylactic drain placement to prevent wound complication, however, is controversial and investigations that have evaluated its efficacy in this setting have reported conflicting results.[10-20] To address the clinical uncertainty related to the use of prophylactic subcutaneous drainage in women undergoing cesarean delivery, we conducted a systematic review of the literature and meta-analysis of data from available randomized clinical trials.

Materials and Methods

We conducted a systematic review of the literature (all languages) to identify all published randomized clinical trials that evaluated the prophylactic use of subcutaneous drains at the time of cesarean delivery. A literature search was conducted using PubMed (National Institutes of Health, Bethesda, MD)(1966-March 2006), OVID Medline (Ovid Technologies, New York, NY) (1966-March 2006), Cumulative Index to Nursing and Allied Health Literature (CINAHL, Cinhal Information Systems, Glendale, CA) (1982-March 2006), EMBASE (1974-March 2006), ACP Journal Club (1991-March 2006), OCLC (1992-March 2006) and The Cochrane Library, which includes the Database of Systematic Reviews (1988-March 2006), Cochrane Controlled Trials Register (CCTR) (1950-2006), Database of Abstracts of Reviews of Effectiveness (DARE) (February 1995-March 2006), Web of Science (1995-March 2006) and Scopus (1960-March 2006). Keywords included: "cesarean section," "cesarean delivery," "cesarean," "subcutaneous," "drainage," "drain," "suction," and "wound complications." The "and" operator was used to combine these terms in varying combinations. Bibliographies of all relevant articles identified by the database searches were reviewed for further references. Published proceedings from the Society for Maternal Fetal Medicine (1997-2006), Society for Gynecologic Investigation (1999-2006) and American College of Obstetricians and Gynecologists (1999-2006) annual meetings were also manually searched for relevant citations.

From the Center for Women's Reproductive Health, Division of Maternal-Fetal Medicine, Department of Obstetrics/Gynecology, University of Alabama at Birmingham, Birmingham, AL.

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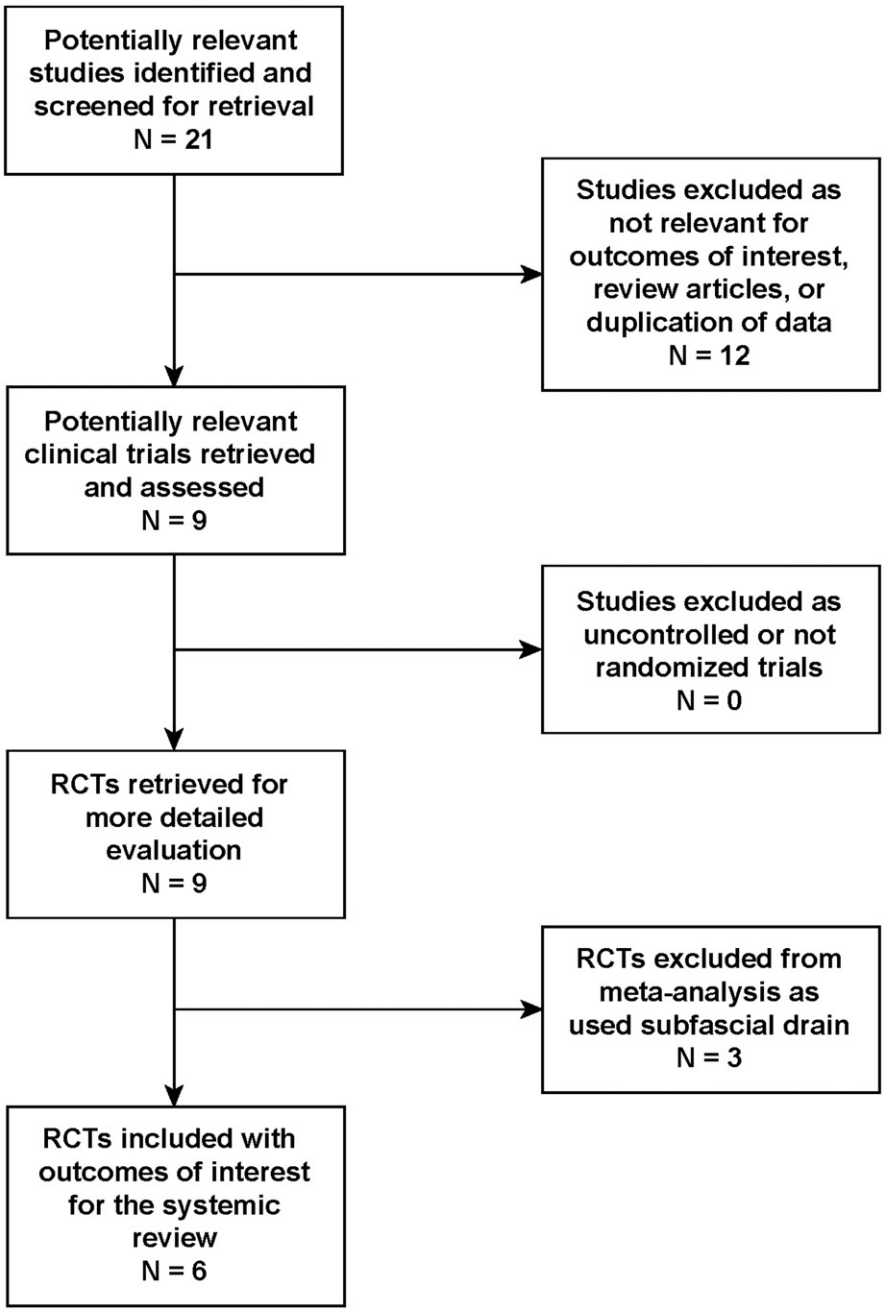
FIGURE 1
Meta-analysis study profile



Meta-analysis profile summarizing study flow.

Hellums. Prophylactic subcutaneous drainage for prevention of wound complications after cesarean delivery. Am J Obstet Gynecol 2007.

For the studies that presented data in abstract form and for those studies in which the data sought were unpublished, a written request for additional data was sent to the primary study authors.

Randomized controlled trials (RCTs) evaluating the prophylactic use of subcutaneous drains in women undergoing cesarean delivery with published results, as either an abstract or complete article, were identified (Figure 1). Investigations that used concurrent subfascial drains in the study design were excluded (Figure 1). All RCTs meeting the above criteria were included in our analysis (Tables 1 and 2). All 3 study investigators (E.H., M.L., P.R.) reviewed the identified publications for study design attributes, inclusion/exclusion criteria, and outcomes. Any disagreement was resolved by consensus.

The primary outcomes for the meta-analysis were as follows: (1) wound separation or disruption, (2) wound infection, (3) wound hematoma, or (4) wound seroma. Specific outcome definitions for the studies included in our analysis are shown in Table 3.

Meta-analysis was conducted in accordance with the QUORUM guidelines by using the Comprehensive Meta-Analysis software package - Version 2.2.020 (Biostat, Englewood, NJ, 2005; www.meta-analysis.com) with a Mantel-Haenszel fixed effects model and formal tests of heterogeneity.[21] A Q χ^2 test of heterogeneity was used for the formal test of heterogeneity in this investigation. When significant heterogeneity ($P < .05$) was noted, a random effects method for pooling the data was used.[22] Statistical significance was defined as a $P < .05$.

RESULTS

Systematic review of the literature identified 21 potential publications for consideration (Figure 1). Of these, a total of 9 RCTs were identified for further evaluation.[10-14,23-26] Two studies were excluded because of the combined use of subfascial and subcutaneous drains.[23,24] One study, which used a subfascial drain alone, was also excluded.[13] The remaining 6 randomized trials were included in our meta-analysis (Figure 1) and are described in Tables 1 and 2.[10-12,14,25] Three of 6 of the studies were performed in the United States[10,11,25] and 5 of 6 were performed in training hospitals with resident house staff.[10-12,14,25] All investigations were performed within the last 20 years (1986-2004). Four of the 6 studies were defined as intent to treat analysis.[10,12,25] All investigations had similar inclusion/exclusion criteria (Table 1).

Information on the drainage systems and antibiotics used in the studies included in the meta-analysis are summarized in Table 2. The types of subcutane-