Journal of Clinical Neuroscience 22 (2015) 1081–1087

Contents lists available at ScienceDirect

Journal of Clinical Neuroscience

journal homepage: www.elsevier.com/locate/jocn

Review

Dressings and drains in posterior spine surgery and their effect on wound complications

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ARTICLE INFO

Article history:
Received 18 January 2015
Accepted 24 January 2015

Keywords:
Dressings
Drains
Spine
Wounds

ABSTRACT

The purpose of this study was to systematically search, critically appraise and summarize published randomized control trials (RCT) and non-RCT examining the effect of drains and dressings on wound healing rates and complications in posterior spine surgery. The use of post-operative drains and the type of post-operative dressing is at the discretion of the treating surgeon with no available clinical guidelines. Drains will theoretically decrease incidence of post-operative hematoma and therefore, potentially decrease the risk of neurologic compromise when the neural elements have been exposed. Occlusive dressings have more recently been advocated, potentially maintaining a sterile barrier for longer time periods post-operatively. A systematic review of databases from 1969–2013 was undertaken. All papers examining drains in spine surgery and dressings in primary healing of surgical wounds were included. Revman (version 5.2; The Nordic Cochrane Centre, The Cochrane Collaboration, Oxford, UK) was used to test for overall treatment effect, clinical heterogeneity and risk of bias. Of the papers identified, 1348 examined post-operative drains in spine surgery and 979 wound dressings for primary wound healing of all surgical wounds. Seven studies were included for analysis for post-operative drains and 10 studies were analyzed for primary wound healing. The use of a post-operative drain did not influence healing rates and had no effect secondarily on infection (odds ratio [OR] 1.33; 95% confidence interval [CI] 0.76–2.30). We were not able to establish whether surgical drains prevent hematomas causing neurologic compromise. There was a slight advantage to using occlusive dressings versus non-occlusive dressings in wound healing (OR 2.09; 95% CI 1.44–3.02). Incisional vacuum dressings as both an occlusive barrier and superficial drainage system have shown promise for wounds at risk of dehiscence. There is a relatively high risk of bias in the methodology of many of the studies reviewed. We recommend favoring of occlusive dressings based on heterogeneous and potentially biased evidence. Drain use does not affect wound healing based on similar evidence. Incisional vacuum dressings have shown promise in managing potentially vulnerable wounds.

1. Introduction

The rationale for the use of surgical wound dressings is to preserve the sterile environment of the operating room, absorb any wound drainage and occasionally deliver a local antimicrobial treatment to prevent wound infection and dehiscence [1–3]. Their use in posterior spine surgery is additionally important in protecting against any pressure or irritation as patients are often nursed on their backs in the early post-operative period. Frictional forces with turning and repositioning can be significant [4].

Deep surgical drains were initially thought to decrease hematoma formation and wound complications, although, many of these concepts have been challenged [5–7]. Drains are used at the discretion of the treating surgeon at the conclusion of the case and the decision is often based on an empirical assessment of the quality of hemostasis achieved, magnitude of the surgical procedure and whether the dura and neural elements are exposed. Many surgeons are more liberal with their use of drains than others [8,9]. Proposed advantages of deep surgical drain use are to control post-surgical wound drainage and to prevent local accumulation of a hematoma [10]. Others will challenge that drains do not prevent hematoma formation and that neurologic compromise can occur with or without a drain [5,11]. A drain also facilitates a direct connection with the outside environment leading to possible deep wound contamination and higher rates of infection. While these theories have

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http://dx.doi.org/10.1016/j.jocn.2015.01.009
0967-5868/

been tested in multiple clinical and preclinical studies no definite consensus has been reached.

There is a paucity of high quality literature examining whether drains or dressings make any difference in wound infection rates [12–14]. Furthermore, there are even fewer studies evaluating whether drains prevent neurologic compromise in patients with extensive posterior surgery who have exposed neural elements either in the lumbar spine with the cauda equina or in the thoracic and cervical spine with the spinal cord. Most of the available literature is retrospective, uncontrolled and small case series with limited numbers of patients in any observation group. It is difficult to form conclusions regarding significance or generalizability of any of the results.

With an abundance of choices for either deep wound drainage or for surgical wound dressing it is important to first establish if any advantage exists to wound dressing and/or drainage and more specifically, to determine whether there is an optimal combination of these that will lead to greater rates of uncomplicated posterior spinal surgical wound healing.

The primary goal of this systematic literature review was to determine recommendations from the current available evidence, with respect to the use of drains and dressings in posterior spinal surgery. In addition, we examined whether there is evidence for specific drain or dressing use in unique clinical scenarios of surgical wounds at risk.

2. Materials and methods

Our primary research question was whether dressings and drains have any impact on healing of posterior spine surgical wounds.

2.1. Study selection and literature search

An initial, informal literature search of PubMed revealed only three randomized control trials (RCT) analyzing drains or dressings in posterior spine surgery and, therefore, criteria were expanded to include both retrospective and prospective cohort and case control studies. Studies were included if their main outcome measure was a wound complication in any posterior spinal procedure from the cervical, thoracic or lumbar spine. Wound complication was defined as infection requiring irrigation and debridement or superficial infection requiring antibiotics, blistered skin, significant erythema and drainage or wounds requiring surgical revision. Additional inclusion criteria were studies that followed wounds to full healing, analyzed simple linear incisions and had detailed information about the particular type and how long a dressing or drain was used post-operatively. Studies were excluded if there was no suitable comparison group, specific numbers of patients were not available or if the wounds healed by any other method than primary healing.

Secondary outcomes of interest were the development of post-operative epidural hematomas. Studies evaluating epidural hematoma requiring evacuation specifically were not included in the formal analysis of wound healing. We did retain these articles for our final evaluation of drains used in spine surgery as a secondary analysis.

In the case of dressings, all studies comparing the use of two or more different types of dressings or the use of a dressing *versus* no dressing in spine surgery were sought. Unfortunately, this search revealed only one article and therefore the inclusion criteria were broadened to include publications from all surgical procedures. Although wound types can be quite different depending on surgical specialty and body site, in order to perform a thorough analysis and make recommendations for dressing type all wounds were included.

After a number of unrefined searches for drains in spine surgery, it was felt that there would be a sufficient number of articles to examine limiting to the spine literature only.

An electronic search of Medline, EMBASE, and the Cochrane Library was undertaken (January 1969–October 2013). Web of Science was used an adjunctive search tool. The tables of contents from the spine journals with the five highest impact factors from the last 5 years were also scanned to determine eligibility for inclusion (The Spine Journal, Spine, European Spine Journal, Journal of Neurosurgery Spine, Journal of Spinal Disorders and Techniques).

Reference lists from all included studies were also scanned for further appropriate studies. Any previous systematic reviews, meta-analyses or Cochrane Reviews of dressings in surgical incisions healing by primary intention were examined for additional articles. No systematic reviews of drains in posterior spine surgery were found as of October 2013.

2.2. Article selection process

Two searches were performed and search results were screened by two independent reviewers. All potential articles identified in the initial search were scanned and evaluated based on the inclusion/exclusion criteria. Titles and abstracts were scanned in the first round and subsequently full text articles were reviewed. Disagreements were resolved on discussion and no arbitrator was needed.

Once full articles were included, data were extracted using data extraction sheets. Contents of the data extraction sheets were as follows: (1) Aim of study; (2) Study design; (3) Study population; (4) Presence of a control group; (5) Inclusion/exclusion criteria; (6) Ethical approval; (7) Funding (if applicable); (8) Number of patients enrolled in study and number analyzed at follow-up; (9) Statistical methods used; (10) Type of dressing/drain used; (11) Assessment of wound healing; (12) Wound healing rates; (13) Incidence of early/late post-operative infection; (14) Blood loss and need for transfusion; (15) Incidence of clinically significant post-operative hematoma (required second operation or increased length of stay); (16) Functional outcome scores and pain scores; (17) Adverse event rates.

Risk of bias for each publication included for final analysis was assessed using Review Manager (Revman; version 5.2; The Nordic Cochrane Centre, The Cochrane Collaboration, Oxford, UK). Each study was assessed individually and had a bias table created from the following critical areas: (1) Random sequence generation; (2) Allocation concealment; (3) Blinding of participants and personnel; (4) Blinding of outcome assessment; (5) Incomplete outcome data; (6) Selective reporting; (7) Other.

Statistical analysis was also undertaken with the help of Revman. Abstracted data was entered from which odds ratios (OR) for risks to wound healing when using a drain *versus* not using a drain could be calculated. OR were also used to compare wound healing with types of dressings used (occlusive *versus* non-occlusive, *et cetera*). Where meaningful quantitative data could not be extracted, qualitative analysis was undertaken. Revman also calculated Higgins I^2 test to assess for heterogeneity between studies.

3. Results

Our search strategy identified 1348 potential papers for review pertinent to the use of drains in spinal surgery and 979 papers for review related to dressings for surgical incisions as of October 2013. After review of abstracts, 108 full text papers on the use of the drains were examined and 78 were included for full text review related to dressings. After full text review, seven articles were included in the final analysis for drains and 10 were included for