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Complications of flat bedrest following incidental dural repair

Author names:

Kristen E Radcliff M.D.; Gursukhman DS Sidhu M.B.B.S.; Christopher K Kepler M.D., M.B.A.; Jordan Gruskay B.A.; D. Greg Anderson M.D.; Alan Hilibrand M.D.; Todd J Albert M.D.; Alexander R Vaccaro M.D., Ph.D

Affiliations:

Rothman Institute

Thomas Jefferson University

Philadelphia, PA 19107

Correspondence:

Correspondence:

Kristen E Radcliff, MD

2500 English Creek Ave.

Egg Harbor Township, NJ 08422

Email: **radcliffk@gmail.com**

Fax: 215.955.4322

Telephone: 609-573-3301

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Abstract

Study Design: Retrospective case series

Objective: To compare the incidence of medical complications after flat bed rest using modern dural repair methods and determine whether bedrest is a risk factor for specific medical complications.

Summary of Background Data: Flat bed rest after incidental durotomy is commonly used to reduce the risk of CSF leakage and associated complications

Methods: Retrospective case series of consecutive patients following lumbar laminectomy between 2005 and 2009 with an incidental durotomy were identified. Medical records were reviewed for duration of bed rest and complications (pulmonary, wound, neurological, gastrointestinal, and urinary) in the chart notes, repair methods, subfascial drain placement, consultant notes, imaging reports, and discharge summaries. Patients were compared with duration of bedrest > 24 hr versus duration of bedrest ≤ 24 hr. The incidence of complications was compared between groups using Fisher's exact test.

Results: There were total 42 patients. There were 18 patients in the bedrest ≤ 24 hr group and 24 patients in the bedrest > 24 hr group. Comparing the bedrest ≤ 24 hr to bedrest> 24 hr patients, there was no statistically significant difference in the incidence of post durotomy related neurological complications, wound complications and need for revision surgery. There was a statistically significant decrease in the incidence of total medical complications in the ≤ 24 hour group (0% vs. 50%, p=0.0003).

Conclusion: There was an increased incidence of medical complications in the bedrest group > 24 hours. Flat bed rest after modern dural repair method may not be a necessity in all cases and may be associated with a higher incidence of medical complications.

Introduction: Incidental durotomy and spinal fluid leak are known common complications of lumbar spine procedures. Reported incidence rate of durotomy ranges from 3.1 to 13% (1-9) in lumbar decompression procedures. The risk of dural tear is increased in certain decompression procedures including revision surgery, laminar fractures, and associated neurological deficit.(1, 3, 5, 10-14) Primary repair of a durotomy defect intraoperatively may reduce the rate of persistent dural tear(5, 6, 15) and prevent the development of symptomatic pseudomeningocele, infection, or cerebro-spinal fluid cutaneous fistula. Consequently, current management of dural tears includes direct repair when possible and/or augmentation/reinforcement with synthetic collagen graft or and dural sealant products. Augmentation of sealants is done to attempt a "watertight closure" of the defect. When dural repair is adequate, the surgeon should see the deflated dura reinflating in a pulsatile fashion.

Postoperative management traditionally involves a short duration of flat bed rest with caffeine and fluids for managing possible spinal headaches. (3, 5, 13, 14, 16, 17) It is postulated that the upright position increases hydrostatic pressure in the lumbar cerebrospinal fluid space and the increased pressure gradient may encourage leakage from repaired dura. Therefore patients are often placed on flat bedrest after dural repair for a number of days at the surgeons' discretion. Disadvantages of prolonged bedrest in the literature include potential for thromboembolic disease, wound infection, pulmonary complications, gastrointestinal complications, and decubitus ulcers. (27-31)

We hypothesize that flat bedrest does not provide additional benefit in the prevention of dural complications compared to nonbedrest after application of modern repair techniques. Furthermore, we hypothesize that there are increased complications from prolonged bedrest after incidental durotomy. We would like to test these hypotheses by comparing the incidence of medical complications and wound complications with modern dural repair techniques in patients with varying degrees of bedrest. The

purpose of the study was to compare the incidence of medical complications after bed rest for dural repair and determine whether bedrest is a risk factor for specific medical complications.

Methods: This study was a retrospective case series of 42 patients. Following institutional review board(IRB) approval, all consecutive cases of single/multilevel lumbar laminectomy between 2005 and 2009 were identified. All selected patients underwent lumbar laminectomy for lumbar stenosis causing symptomatic neurogenic claudication or lumbar radiculopathy. All cases were from a single spine surgical center. Eligible cases with dural tears repaired with modern techniques were identified by selecting cases in which a Polyethylene Glycol(PEG) polymer sealant (Duraseal^{TM}) was used from an operating room charge database. Operative reports of cases with an incidental durotomy were identified by directly inspected for documentation of any report of "dural tear, arachnoid cyst, spinal fluid leak, or incidental durotomy" intraoperatively. Following durotomy, all dural tears in this case series were repaired with 6-0 Goretex suture or 4-0 neurolon in an interrupted or running fashion according to the preference of the treating surgeon. The repair was augmented with duragen graft directly applied to the repair site followed by application of a PEG polymer sealant (Duraseal^{TM}) to the site. Two solutions composed of water-soluble polyethylene glycol and trilysine amino acid, were combined by the syringe applicator to form a sealant (Duraseal^{TM}) which was applied to augment the dural repair site and make it "watertight". All cases after repair were examined for sustained leakage by reverse trendelenberg test and Valsalva maneuver. Medical and surgical records were reviewed for duration of flat bed rest prescribed by the surgical care team.

The use and duration of flat bed rest was given based on surgeon preference. Some surgeons at our center recommend a period of 24-48 hours of flat bed rest with logroll privileges in all durotomy cases and other surgeons order early ambulation in all cases. Other parameters included determining subfascial drain

placement after the procedure and American Society of Anesthesiologists (ASA) scores. Drain placement after a dural tear is based upon surgeon preference at our institute. Antibiotic coverage was only recorded if physician order provided for additional broad spectrum antibiotic coverage along with standard of care postoperative antibiotics. Patient postoperative complications were determined by looking at no. of pulmonary, cardiac, gastrointestinal, and urinary events during the postoperative course in the chart notes. Episodes of post durotomy headache, were only recorded if meeting the criteria defined in the International Classification of Headache Disorders (35), and significant enough to require treatment with caffeine. Causes of re-operation after initial surgical procedure were also determined. Patients were compared with duration of bed rest > 24 hours versus duration of bed rest ≤ 24 hours. The incidence of complications was compared between groups using Fisher's exact test. A Post hoc power analysis was performed for parameters determined not to have a significant association.

Results:

Baseline group characteristics

A total of 1591 lumbar laminectomy cases were identified during 2005 to 2009 time period. Out of these, a total of 50 patients reported Duraseal usage. 42 patients reported an incidental durotomy intraoperatively (2.6%). 18(43%; 95% Confidence interval, 29% to 58%) patients were identified in the bed rest ≤ 24 hr group and 24(57%; 95% Confidence interval, 42% to 71%) patients in the bed rest > 24

hr group. Demographic variables are listed in TABLE 1. There were 9 patients who did not receive any bed rest. ASA physical status classification system scores were determined for the patients in both groups. Patients with ASA scores ≤ 2 and > 2 were equally distributed in both groups (P= 0.9025). Subfascial drains were placed in a total of 11 patients (26%). Average duration of drain placement was 2 days. No difference was observed between both groups with duration of bed rest, drain placement and associated wound complications. (P=0.73)

Complications

Complications are listed in TABLE 2. There were 4 total pulmonary complications (1 pneumonia, 2 atelectasis, and 1 case with pulmonary edema). There were 12 wound complications including 2 patients with persistent drainage, 9 postoperative broad spectrum antibiotics administered, and 1 wound infection. There were 12 complications related to the durotomy(CSF complications - 9 headaches with caffeine administration, 2pseudomeningoceles, and 1 blood patch).

Comparing the bed rest ≤ 24 hours to bed rest > 24 hours patients, there was no statistically significant difference in the percentage of patients with CSF complications (≤24 hours 39% vs.> 24 hours 21%, p=0.12) or wound complications (22% vs. 33%, p=0.21). There was no statistically significant difference in the incidence of additional surgery including for pseudomeningocele (11% vs. 0%, p=0.18) or infection (0% vs. 4%, p=0.57). There was a statistically significant decrease in the incidence of total medical complications in the ≤ 24 hour group (0% vs. 50%, p=0.0003). A post hoc power analysis was performed based out of durotomy complication data provided by Guerin et al (3). Given the numbers of patients, our study was powered to detect a 63% difference in reoperation between groups and a 60% difference in complications related to the durotomy and a 90%% difference in wound complications.

Discussion: There was no statistically significant difference in the incidence of durotomy related complications, wound complications between groups. There was statistically significant increased incidence of medical complications in the bed rest group > 24 hours. Taken together, these results suggest that surgeons reconsider the benefits of bed rest > 24 hours in patients with incidental durotomy.

Incidental durotomies without primary repair can lead to a persistent cerebrospinal fluid leak, meningitis, arachnoiditis, pseudomeningocele, chronic pain and nerve root entrapment with resultant neurological damage. (1, 3, 5, 6, 18-20) Previous studies demonstrate mixed results in overall complication rates after intraoperative repair of Dural tear/spinal fluid leak. Saxler et al(7) reported poorer prognosis for patients with an incidental durotomy after lumbar disc surgery while Camissa et al(1) reported no difference in complication rate associated with a dural tear after watertight closure of the defect.

A "watertight closure" is considered to be the most important factor in closing a durotomy site. When dural repair is adequate, the surgeon should see the deflated dura reinflating in a pulsatile fashion. The repair also should be tested with a Valsalva maneuvre and a reverse Trendelenburg test done by an anesthesiologist. Symptoms of a persistent CSF leak (positional headache, nausea, and/or photophobia), may continue for a few days postoperatively despite successful repair with management involving IV fluids (21), oral or IV caffeine(22), or an epidural blood patch. (23, 24) Use of a subfascial drain after dural repair remains controversial with some authors advocating use of drains in all cases(13) with a durotomy defect while other authors deem it unnecessary(5).

Bed rest is advocated as a management option after intraoperative repair of durotomy defect with duration varying upon surgeon preference, although bedrest is a controversial treatment. (25) Eismont et al (14) reported that bed rest for unrepaired dural tears was an ineffective management technique. Wang et al in a restrospective case control study , used bed rest after dural repair for an average duration of 2.9 days with good postoperative results.(13) Guerin et al(3) used an average duration of 2.68 days bed rest while Cammisa et al(1) used bed rest ranging from 3 to 5 days in all patients. However, these previous studies did not include modern dural repair techniques including the use of fibrin glue. Hodges et al(4) in a retrospective review of 20 patients found that 75% of patients performed very well without any bed rest after repair of an incidental durotomy during surgery with modern dural repair techniques. However each of the incidental durotomies were between 1 and 3 mm in length. Sudlow et al (26) in a systematic review of randomised trials found no good evidence to suggest that routine bed rest after dural puncture to be beneficial. However, these previous studies have not evaluated short duration of bedrest (24 hours) and have not evaluated concomitant medical sequelae of bedrest. Patient in supine bedrest may be at increased risk of aspiration, thromboembolic disease, wound infection, ileus, and decubiti. (27-31) Early ambulation with minimal bed rest has been documented to improve patient outcomes in many surgical procedures while achieving substantial savings in reducing hospital stay. (32-34)

Limitations of this study include the retrospective nature of the analysis. However, since incidental durotomy is a rare complication with potentially serious clinical and medico-legal consquences, we believe that a retrospective analysis is a valuable initial step to validate a prospective study. Patients in this analysis were not randomized for bed rest or duration of bed rest. Furthermore, the dural repair techniques were heterogeneous. Some patients may have had more watertight repairs or had running versus interrupted sutures. It is possible that bedrest may be beneficial for certain types of dural tears, particularly those with poor primary repair. To the authors knowledge, there is no accepted classification of dural tear morphology to describe durotomies. It is our anecdotal experience that tears in particular

locations (far lateral, anterior, or nerve root sleeve) are more difficult to repair and perhaps may benefit from bedrest.

Strengths of this study include the large number of patients and the well defined clinical endpoints. Although there is a possibility for type II error whenever a negative result is identified, we believe that our data are adequately powered to detect a clinically significant effect size difference in CSF complications, wound complications, and reoperation. If the incidence of CSF complications is so low in the study population that it is impossible to detect a statistical difference while the incidence of medical complications is statistically significantly different, then we believe that surgeons should consider shorter duration of bedrest to avoid the more likely medical complications. There are more patients in this study than in the previous studies and this study represents a consecutive collected clinical case series. Additionally, there may be patients who had incidental durotomy that were not included in the study. The purpose of this study was to evaluate the utility of bedrest in patients who underwent repair using modern adjuvant techniques, such as Duraseal. Therefore, patients who underwent repair without Duraseal would be ineligible for inclusion in the study population.

In conclusion, these results suggest that bedrest greater than 24 hours may increase medical complications without a concomitant reduction in wound or CSF complications. Surgeons should carefully consider the potential for such medical complications in their patients while advocating strict bed rest. Future prospective studies on this topic may determine that modern dural repair agents may obviate the need for historical treatments such as bedrest.

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Demographic Data			
	Bedrest≤ 24 h Group	Bedrest>24 h Group	P-Value
Number of Subjects	18	24	-
Average Age	55	58	0.5
% MALES	55%	62.50%	0.75
PREVIOUS SURGICAL PROCEDURE: I.E IF A REVISION LAMINECTOMY	6	7	0.75
ASA>2	5	9	0.74
ASA≤2	13	15	
SUBFASCIAL DRAIN PLACEMENT	4	7	0.73

Table 1: Demographic Data

ASA: American Society of Anesthesiologists score for co-morbidity

NAME	BEDREST < 24 hours	BEDREST > 24 hours
PULMONARY COMPLICATIONS	0	4
ILEUS	0	1
DEEP VENOUS THROMBOSIS	0	1
INFECTION	0	1
URINARY COMPLAINTS	0	4
CARDIAC COMPLICATIONS	0	2
POST DUROTOMY HEADACHE	4	5
ANTIBIOTIC PRESCRIPTION	3	6
POSTOPERATIVE DEVELOPMENT OF PSEUDOMENINGEOCOELE	2	0
BLEEDING/ COAGULOPATHY INTRAOP	0	1
WOUND DRAINAGE	1	1

Table 2: Overall complications among groups