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Original article

Early reintervention after anterior cervical spine surgery: Epidemiology and risk factors: A case-control study

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ABSTRACT

Introduction: Anterior cervical spine surgery is a frequent and effective procedure; complications are rare, but potentially fatal. The objective of the present study was to assess epidemiology and risk factors for early reintervention in anterior cervical spine surgery.
Methods: A retrospective case-control study recruited 2319 patients operated on in our department, with 7 years' follow-up. Incidence and prevalence of causes of early reintervention were analyzed. Each case was matched to 2 controls from the same source population. Risk factors were identified and odds ratios (OR) were calculated.
Results: Thirteen patients (0.6%: 3 female, 10 male; mean age, 59 ± 12 years) underwent surgical reintervention within 72 hours. Causes comprised: retropharyngeal hematoma (0.2%), epidural hematoma (0.3%) and dural breach (0.04%). As risk factor for early reintervention, only ASA score ≥ 3 proved significant (OR: 5.5; 95% confidence interval: 1.1–29.85). As risk factor for epidural hematoma, only smoking proved significant (OR: 14.67; 95% confidence interval: 1.16–185.29). No risk factors emerged for onset of retropharyngeal hematoma.
Conclusion: ASA score ≥ 3 and smoking entail risk of epidural hematoma and early reintervention. Postoperative pain, neurologic deficit, dysphagia, dysphonia, dyspnea and agitation suggest onset of complications, requiring necessary measures to be taken. Implementation of drainage fails to prevent such complications.

1. Introduction

Anterior cervical spinal surgery is frequently performed for degenerative, traumatic and tumoral pathologies, allowing fusion, internal fixation and arthroplasty [1,2]. The most frequent complications are transient dysphagia and dysphonia [3]. Less common but more serious complications comprise dural breach, laryngopharyngeal or esophageal perforation or vascular lesion to the jugulo-carotid axis or vertebral artery [4]. Spinal hemorrhage in the anterior approach to the cervical spine is another possible rare complication. And retropharyngeal hematoma, although very rare, is life-threatening without surgical reintervention [5].

Retropharyngeal hematoma consists of airway compression by a deep hematoma, with onset generally within 12 hours of primary surgery. Spinal hemorrhage consists of neural compression by hematoma, with onset generally within 48 hours of primary surgery. Given the success of day-surgery, certain cervical spine procedures will increasingly be performed on this basis. Identifying risk factors for complications and possible at-risk patient profiles is thus essential. And finally, it is necessary to be aware of the incidence and prevalence of these complications so as to be able to provide patients with appropriate information.

The main objective of the present study was to assess incidence and prevalence and risk factors of early (< 72 hours) surgical reintervention following anterior cervical spine surgery (excluding oral approaches), on 7 years' follow-up, in a case-control study.

2. Materials and methods

2.1. Series

A total of 2319 patients were operated on between 2006 and 2013 using an anterior approach to the cervical spine (excluding

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Table 1
Data for the series of 13 patients with early (< 72 hours) reintervention.

Patient	Age	Indication	Procedure	Etiology
1	69	Cervical spondylotic myelopathy	Corpectomy C6 + cage + plate	EH
2	51	Cervical spondylotic myelopathy	Corpectomy C6 + cage + plate	EH
3	45	CBN C5C6 C6C7	Discectomy C5C6 C6C7 + cage	EH
4	55	CCE	Discectomy C3C4 + cage	EH
5	36	Cervical spondylotic myelopathy	Corpectomy C7 + iliac autograft + plate	EH
6	74	Cervical spondylotic myelopathy	Discectomy C5C6 + cage + plate	EH
7	55	CBN C5C6	Discectomy C5C6 + cage	EH
8	69	CCS	Discectomy C3C4 C7T1 + cage + plate	RH
9	79	C7 fracture on ankylosing spondylitis	C5T1 plate fusion	RH
10	68	Cervical spondylotic myelopathy	Corpectomy C4 + cage + plate	RH
11	48	CBN C5C6 C6C7	Discectomy C6C7 + cage and C5C6 discal implant	RH
12	62	CCS	Discectomy C3C7 + cage + plate	RH
13	61	CBN on bone cyst	Corpectomy C5 + cage + plate	BD

EH: epidural hematoma; CBN: cervicobrachial neuralgia; CCS: cervical canal stenosis; RH: retropharyngeal hematoma; DB: dural breach.

oral approaches), 13 of whom required emergency reintervention: 1 dural breach, 7 epidural hematomas and 5 retropharyngeal hematomas. The study series thus comprised 13 patients: 3 female, 10 male; mean age at surgery, 59 ± 12 years (range, 36–79 years), for a median 61 years. Mean body-mass index was 26.5 ± 4 kg/m^2 (range, 20–32 kg/m^2), with 62% of patients obese or overweight. Patient data are shown in Table 1.

2.2. Surgical technique

Mean primary-to-secondary surgery interval was 27 hours (range, 3–72 hours), for a median 16 hours. Surgery reutilized the primary approach. Any dural breach was closed by fine resorbable suture. In case of active bleeding, meticulous hemostasis was implemented. In case of epidural hematoma, diagnosis was confirmed on emergency MRI. Material was ablated and reintroduced after hematoma evacuation and hemostasis.

There was no active bleeding in the 5 retropharyngeal hematomas. Active epidural bleeding was observed in 43% of epidural hematomas (3/7).

In 2 of the retropharyngeal hematomas (40%), intubation was reported to be difficult by the anesthesia team, requiring preliminary evacuation in 1 case.

2.3. Assessment

Retrospective file analysis was able to collect follow-up data for all 13 patients. Prevalence and incidence of retropharyngeal and epidural hematoma were calculated. Baseline demographic data included age and gender. Risk factors investigated comprised body-mass index, active or former smoking, American Society of Anesthesiologists (ASA) score, comorbidities such as diabetes, hypertension, cardiopathy, pneumopathy, coagulation disorder (whether primary, or secondary to anticoagulation therapy) and administration of anti-platelet agents. For primary surgery, type of procedure, operative time, implementation of drainage, number of levels treated and performance of corpectomy were recorded. Postoperatively, drainage volume was assessed on a 3-point scale (1 = low, 2 = moderate and 3 = large volume); other variables comprised: pain at diagnosis on a visual analog scale (VAS), clinical signs indicating reintervention, primary-to-revision interval, bleeding site (when identified), hospital stay, and time to return to work.

Each case was matched to 2 control subjects from the source population, this number being chosen to avoid selection bias by excessive matching.

Risk factors for early surgical reintervention were analyzed.

2.4. Statistical analysis

Statistical analysis used SAS StatView 5.0 software. Quantitative variables were analyzed on Student *t*-test and qualitative variables on Chi^2. For matched quantitative variables, a matched-pair *t*-test was used. Non-parametric tests comprised Fisher exact test for qualitative variables and Mann-Whitney test for quantitative variables. *P*-values were compared, and an alpha risk of 0.05 was considered significant. Raw odds ratios were calculated for identified risk factors using epidemiological case-control methodology.

3. Results

Thirteen of the 2319 patients (0.6%) undergoing anterior cervical spine surgery during the study period required reintervention within 72 hours: 5 retropharyngeal hematomas (0.2%), 7 epidural hematomas (0.3%), and 1 dural breach (0.04%).

During 2013, the early reintervention rate was 1.1%: 0.8% for retropharyngeal hematoma and 0.4% for epidural hematoma.

3.1. Comparison between early reintervention and controls

Table 2 compares the 13 patients with early surgical reintervention and their control subjects. Raw odds ratios for the corresponding risk factors were calculated in case of significant difference. ASA score, rate of coagulation disorder (primary, or secondary to anticoagulation therapy) and operative time differed

Table 2
Comparison between early reintervention and control groups.

Characteristics	Cases (*n* = 13)	Controls (*n* = 26)	*P* (NS)
Age (years)	59 ± 12	50 ± 13	NS
Gender (male/female)	10/3	17/9	NS
Body-mass index (kg/m^2)	27 ± 4	27 ± 3	NS
ASA score	2.2 ± 0.7	1.7 ± 0.8	*P* = 0.01[a]
Smoking	8/13	11/26	NS
Diabetes	1/13	2/26	NS
Hypertension	3/13	4/26	NS
Cardiopathy	2/13	1/26	NS
Pneumopathy	0/13	2/26	NS
Cancer	0/13	2/26	NS
Coagulation disorder	3/13	0/26	*P* = 0.01[a]
Anti-platelet therapy	4/13	2/26	NS
Operative time (min)	75 ± 35	55 ± 11	*P* = 0.01[a]
Absence of drainage	3/13	1/26	NS
Number of levels	2.07 ± 0.9	1.73 ± 1	NS
Corpectomy	5/13	9/26	NS
Postoperative VAS (/10)	6.5 ± 1.4	3.8 ± 1.3	*P* = 0.001[a]
Hospital stay (days)	5.5	3.2	*P* = 0.02[a]

NS: non-significant.
[a] Significant results.