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Long-term functional results after short-segment pedicle fixation of thoracolumbar fractures

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ABSTRACT

Purpose: A retrospective study to assess the health-related quality of life in patients undergoing posterior fixation of thoracolumbar fractures, and to compare the outcome with norm scores and HRQL in patients undergoing surgical treatment for degenerative conditions of the spine.
Methods: The study population consisted of 93 consecutive patients surgically treated for a thoracolumbar fracture from 2005 to 2009. All patients underwent posterior pedicle screw fixation and fusion. 83 patients were available for follow-up. Three questionnaires reflecting health-related quality of life (HRQL) were mailed to the patients: SF-36, ODI, and EQ-5D.
Results: 52 men and 31 women were operated with an average age at the time of surgery of 46 years. All fractures were AO-type A3.1 and A3.2 with L1 being the primary fracture level. All patients were neurologically intact; Frankel E.

The overall response rate on the questionnaires was 75% with no significant differences between responders and non-responder on basic demographic characteristics. The median follow up period was 3.8 years (range 2–6 years). The scores on all three questionnaires were significantly reduced compared to the national norm scores ($p < 0.05$).
Conclusion: Health-related quality of life is affected several years after short segment posterior instrumentation of thoracolumbar fractures without neurological deficit.

Introduction

Spine fractures remain a clinical challenge in the trauma population, about 20% of patients admitted to a trauma centre will have a spine injury [1]. The majority of severe spinal injuries affects the thoracolumbar junction, although neurological injuries remain the primary concern, the choice of treatment in neurologic intact patients is still under debate [2]. The issues include: surgical versus conservative treatment, timing of surgery, choice of surgical technique, whether or not fusion should be performed [3–5].

The choice of surgical technique is largely based on the classification of the fracture. The AO classification has gained wide acceptance for this purpose and most authors advocate surgical stabilization of fractures caused by distraction and rotation injuries (AO types B and C) [6,7,8]. There is, however, still controversy regarding the indication for surgical treatment of fractures caused by compression injuries, i.e. burst fractures (AO type A) [9].

In addition to the radiological and surgical aspects of fracture treatment there has been increasing interest in the functional outcome after spinal injuries, and since the number of studies focusing on this aspect is still limited we found it of relevance to compare the health related quality of life in patients with thoracolumbar fractures without neurologic injury, with that of the general population.

Materials and methods

The study includes all patients undergoing surgical treatment for a thoracolumbar fracture without neurological injury from January 1st, 2005 until October 31st, 2009. None of the patients had other significant injuries and all fractures were classified as AO type A3.1 and A3.2 fractures.

Surgical procedure

All patients were operated through a posterior midline incision at the thoracolumbar junction. After identification of the correct level using an image intensifier, a subperiosteal exposure was performed. In the majority of cases, pedicle screws were placed with free hand technique one level above and one level below the fractured vertebrae, and 6 mm rods were connected to the pedicle screws connectors allowing correction kyphosis if present. In a

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small number of cases, pedicle screws were only placed in the fractured vertebrae and the vertebra above.

The position of the implant and the sagittal balance was ensured with image intensification, prior to decortication, partial facet joint resection and fusion with local bone. In none of the cases decompression or direct reduction of bone fragments was performed.

None of the patients wore a brace in the postoperative period and free movement was allowed.

A total of 93 patients were operated in the study period. By November 1st, 2011 six patients had died from unrelated reasons and four had no current address, leaving 83 patients available for follow-up. Three questionnaires were mailed to the patients; one disease specific questionnaire, Oswestry Disability Index (ODI) and two general health questionnaires, EuroQuol-5D (EQ-5D) and Short Form 36 (SF-36). The questionnaires are all part of the Danish national spine registry DaneSpine (www.danespine.dk).

The Oswestry Disability Index (ODI) is a 10-item disease specific questionnaire developed on patients with back pain. Each item consists of six statements, each marked with a score from 0 to 5, with higher scores reflecting higher disability. The total score is divided with the highest possible score × 100 to produce the ODI [10].

The EQ-5D describes five dimensions of HRQL with each dimension having the score 1, 2, or 3; increasing scores reflecting higher disability. The answers are combined to express a five-digit health status making comparison with norm populations possible [11].

The SF-36 consists of 36 questions producing eight dimensions of health-related quality of life (HRQL). Each dimension is presented as a score from 0 to 100 with higher scores reflecting better HRQL. Furthermore, a physical and mental component score is calculated [12].

Fisher's exact test was used for comparison of frequencies. Mann–Whitney test was used for comparison between two groups. For comparison of HRQL-scores the power calculations provided in the literature was used [10,13].

In all statistical analysis a significance level of <0.05 was chosen.

Results

Of the 83 patients, 31 were women and 52 men. The mean age at the time of surgery was 46 years (range, 17–76 years) with no age difference between genders and the fracture level being L1 in the majority of the cases (Table 1).

One patient was re-operated because of implant failure and pseudarthrosis was found during revision surgery.

50% of the patients were injured in automobile accidents, 15% fell from height and 12% sustained a motorcycle accident. The remaining patients were pedestrians or patients sustaining crush injuries.

Sixty-two patients returned one or more questionnaires corresponding to an overall response rate of 75% after one reminder. The completion rates varied insignificantly between the three types of questionnaires with 75% for ODI, 73% for EQ-5D, and 67% for SF-36 ($p = 0.97$).

There were no significant differences between responders and non-responders regarding sex, age at surgery, trauma mechanism, follow-up, or fracture level ($p = 0.1$).

The primary finding of the questionnaires was that the patients reported reduced HRQL on all three questionnaires.

All scores on the SF-36 domains were significantly reduced compared to the Danish norm scores. Also, ODI was higher than in asymptomatic individuals.

The mean EQ-5D index score was 0.71 which is lower than the index score an age matched Danish population [13].

The detailed results of the three HRQL questionnaires with corresponding response rates are shown in Tables 1 and 2 and Fig. 1.

Table 1
Patient demographics.

Cohort	83
Male/female ratio	1.7/1
Mean age at injury	46 years (range 17–76 years)
Mean follow-up	3.8 years (range 2–6 years)
Fracture level	
T11	3
T12	24
L1	44
L2	12

Table 2
Oswestry Disability Index.

	N	Mean	Std. deviation
Personal care	62	0.8	1.0
Lifting	62	1.7	1.4
Walking	62	1.0	1.3
Sitting	62	1.2	1.2
Standing	62	1.4	1.3
Sleeping	62	1.0	0.9
Sexlife	56	1.2	1.6
Social life	62	1.4	1.3
Travelling	62	1.2	1.1
ODI		24.9	19.2

Discussion

Compared to previous reports in the literature the strength of the present study is that a consecutive series of patients operated for similar fractures were included. Furthermore, the number of patients is comparable to other studies, and all patients had a minimum follow up of two years. The results document that health related quality of life after posterior short segment pedicle screw fixation of thoracolumbar fractures without neurologic impairment is negatively affected several years after surgery.

There is general agreement that outcome questionnaires are invaluable in the evaluation of results after spine surgery. Most authors suggest that both disease specific and a general health questionnaires should be used [14]. Since there is no disease specific questionnaires for patients with spine fractures, the ODI was chosen because it is related to chronic back pain and as such leaves the possibility of obtaining comparable results with other spinal conditions.

The mean ODI score in the present study is higher than the score reported for a normal population where the ODI has been reported at an average of around 10 [10]. An ODI around 20 is defined as moderate disability. Higher scores have been reported in various conditions of the spine with chronic back pain and metastasis presenting the highest degree of disability with an average score around 50. A sample size of 60 as in the present study, should make it possible to detect differences in ODI of about 5 with a significance level of 0.05 and a statistical power of 80% [10].

As opposed to disease specific questionnaires one of the advantages using general health questionnaires is that HRQL can be compared between different diseases.

A number of studies have reported the EQ-5D scores in spinal pathology and the tool has been extensively used in health economic studies. In a recent study of patients with low back pain and the health economic effects of stratified treatment, EQ-5D scores varied from 0.33 to 0.72 depending on prognosis, with the highest scores in patients with the most favourable prognosis [15].