The Outcome at 3 years after Surgical Treatment of Pyogenic Spinal Infection

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Abstract

Introduction

Most patients with pyogenic spinal infections (PSI) are treated conservatively and only severe cases require surgery. The aim of the present study was to elucidate the outcome in patients treated surgically for a PSI.

Patients and methods

In 2001 and 2002 a total of 30 patients underwent surgery for PSI at the above department. In 2005 the outcome in 19 patients (10 males) was assessed. Nine patients had died and 2 were excluded. The outcome variables were ADL parameters, SF-36, a test of the cognitive status (MMSE), and three functional tests. Mean age at follow-up was 64 (35-82) years.

Results

30% had died at 3 year postoperatively as a combination of the PSI and the high level of co-morbidity. The changes in pre- and postoperative ADL parameters were non-significant. At follow-up the use of appliances to assist walking was 47% compared to 21% at preoperatively, the SF-36 was significantly lower than age-matched controls, and the MMSE score was moderately decreased. Regarding the functional status – by the Tandem-test, Timed up & go, and the Chair-stand test – this was overall at the same level as in controls.

Interpretation

PSI is characterised by unspecific symptoms, a significant diagnostic delay, and that it commonly appears in elderly high-risk patients with extensive co-morbidity. Surgical treatment in severe PSI is associated with a high mortality rate. In these cases where conservative treatment proves insufficient and surgical treatment unavoidable the outcome is considered as being acceptable.

INTRODUCTION

Pyogenic spinal infections (PSI) are accounting for less than 10% of all osteomyelitis. The incidence of acute PSI in Denmark is approximately 5/mill/year [18] with a peak in the 6th decade [9,26]. The general treatment principles are immobilization and antibiotics. Severe cases however may require surgical treatment with debridement and spinal stabilisation and we have been unable to locate studies on the clinical outcome after surgical treatment in these the most serious cases. The aim of this study was therefore to evaluate the outcome in 30 consecutive patients treated surgically for a PSI.

PATIENTS AND METHODS

PATIENTS

The study consists of 30 patients who underwent surgical debridement subsequent to a PSI. It consists of a retrospective part regarding the perioperative variables and a prospective part evaluating the clinical outcome. The 30 patients had their surgical procedure at the above department from January 2001 to December 2002.

Table 1 presents data on each of the 30 patients regarding the primary indications for surgery, the surgical procedures, the affected spinal segments, the predisposing factors, and

the isolated micro organism.

Table 1: outcome-tbl1.pdf

Figure 2

Table 2: SF-36

Scale	PSI	Danish sample 65-75 years*	p-value
SF-36			
Physical Functioning (PF)	56(41-71)	74(71-76)	p<0.001
Social Functioning (SF)	70(55-85)	90(88-92)	p<0.001
Role Physical (RP)	49(31-66)	63(59-67)	p<0.001
Role Emotional (RE)	56(38-75)	78(75-82)	p<0.001
Mental Health (MH)	79(70-89)	82(81-84)	p<0.001
Vitality (VT)	57(43-72)	69(67-71)	p<0.001
Bodily Pain (BP)	51(34-69)	78(76-80)	p<0.001
General Health	58(42-74)	66(64-68)	p<0.001

Data are mean (95% c.i. in the brackets)

n=427

We divided the surgical indications into 7: Insufficient conservative treatment, paravertebral, bony-, discus-, or epidural abscess, neurological deficit, and pain resistant to analgesics.

In 2005 the clinical outcome in the study group was assessed in the outpatient clinic or in the patients' homes. Nine patients had died, one patient was not interested in participating in the study, and one patient could not be located. This leaves 19 patients (10 men) with a mean age at follow-up of 64 (35-82) years.

SURGICAL PRINCIPLES

Our surgical principle was to “go where the pathology is” i.e. approach the location of the infection in the involved vertebrae. We aimed for complete removal of pus, necrotic tissues, and debris, and we performed a supplementary neural decompression when indicated from either significant epidural infectious changes on the MRI examination or from clinical neurological impairment. The cleaned cavity was irrigated and then we installed aminoglucoside-sponges (Gentacoll®). In the anterior approaches we placed a primary structural bone graft using either a rib or a tricortical graft from the iliac crests. In the cases with significant purulence we did not place bone graft due to the risk of renewed infection. In 11 patients we carried out a second operation with a posterior rigid pedicle screw fixation a.m. Synergy and autologous bone transplantation from the iliac wing. The indication for this was insufficient stability in the anterior column judged primarily from the peroperative observations in the first operation.

EVALUATION OF THE CLINICAL OUTCOME

Clinical follow up was at mean 35 months postoperative using the outcome variables:

- Barthel Index - a ten-question scale used as a measure of independence from any kind of help, both physically and verbally [7].
- SF-36 - constructed to survey health status. It yields an eight-scale profile of functional health and well-being scores as well as physical and mental health measures and was constructed for group comparisons involving generic health concepts not specific to age, disease or treatment group [1, 11].
- Mini Mental State Examination (MMSE) - a widely used method for assessing the cognitive mental status [5,10].
- VAS score – a Visual Analogue Scale where pain can be indikated from 0-100. Zero represents the worst thinkable pain and 100 no pain.
- Tandem test - with the purpose of testing the balance. It is divided into (1) Side-by-side: feet side by side, touching, (2) Semi-tandem: side of the heel of one foot touching the big toe of the other; and (3) Tandem: heel of one foot directly in front of and touching the toes of the other foot [12].
- Timed up & go - constructed to quantify functional mobility [20].
- The 30second chair stand test – a measure of lower body strength, where the patient performs as many repeated chair stands as possible in 30 sec.

STATISTICS

The significance of changes within groups was analyzed by the use of Wilcoxon signed-ranks test and the difference between groups with the Student's t-test.

RESULTS

RETROSPECTIVE DATA

Lack of effect of conservative treatment and paravertebral abscess were accounting for almost half of the surgical

indications (n=24). The primary surgical procedure was in 26 patients debridement from a ventral approach and 11 of these patients (42%) had a secondary procedure with fusion from a dorsal approach and instrumentation with titanium Synergy.

The majority of cases had primarily axial pain from the PSI (n= 24) whereas 8 patients had neurological deficits and 7 suffered from radiating pain in the lower extremities.

Only 6 patients in the present cohort had no obvious predisposing factors. In 21 patients the bacteria was isolated which in the majority of cases was Staphylococcus Aureus (n=12). The diagnostic delay - from the first symptoms of PSI until diagnosis - was mean 42 (7-168) days.

PROSPECTIVE DATA

Nine patients (30%) had died at the time of follow up at mean 98 (11-240) days postoperatively.

Five died from unknown causes and no autopsy was performed. One patient died from a disseminated cancer, 1 from cardiac insufficiency, 1 due to multiple myeloma, and 1 died from fungal endocarditis in combination with a pulmonary embolus and bronchopneumonia.

In the study group of 19 patients the Barthel index at follow-up was mean 18.7 (range 15-20) compared to a reconstruct value of mean 17.7 (range 6-20) before the PSI. (p=0.893). The use of appliances to assist walking was 47% at follow-up compared to 21% before PSI. At follow-up the MMSE score was mean 26.6 (range 21-29) and the mean VAS score was 60 (range 0-100).

Table 2 gives the individual SF-36 scores in the PSI patients compared to a group of Danish controls [2]. In the study group the SF-36 was significantly lower than age-matched controls in all subscales.

{image:2}

Regarding results of the Tandem test together with data from a control group (in brackets) [13] 100% in the PSI group were able to perform the side-by-side stand (90%), 89 % could perform the semi-tandem stand (76%), and 67 % the tandem stand (40%). The PSI group was thereby markedly better than control group. Timed up & go was mean 14.4 seconds (range 8.0-28.7) and thereby significantly lower than three out of four groups of normal age-matched controls ($p<0.001$; $p<0.001$; $p<0.001$ and $p=0.266$) [16, 17, 25, 27]. The 30-second chair stand test has a mean of 8.4 (range 4-25) times with one in three of the patients using the help of the arms. The PSI group was significantly lower than healthy controls in this test ($p<0.001$) [23].

DISCUSSION

To the author's best knowledge this is the first study on the late outcome in the patients treated surgically for a pyogenic spinal infection.

In this study on 30 patients Staphylococcus Aureus was the most common identified bacteria, which accords with the literature [14, 15, 28]. The most frequent indication for an operation was the lack of effect of conservative treatment or a paravertebral abscess. In agreement with the literature we found the spinal infections to most commonly be located in the lower lumbar spine, in most instances to be preceded by a compromise in the immune system, and in many cases to be proceeded by infections elsewhere e.g. in the upper respiratory tract, the genitourinary tract, or by a sepsis [6, 8, 19, 30]. These observations render probable that the present study group mimics the patients with severe PSI requiring surgical treatment in the average orthopaedic spinal department.

A mortality rate of 30% was observed at the time of follow-up at mean 98 (11-240) days postoperatively but a similar figure was reported by Carrage [3]. The mortality rate must be interpreted as a combination of the PSI and the high level of co-morbidity in these patients. Due to a general poor status of the patients the overall mortality rate from spinal infections remains as high as 20% [4, 22]. The causes of death in the present survey group were of a large diversity and no general pattern could be revealed. It does not seem as if the causes of death in the patients treated surgically for a PSI are directly related to the infection.

The diagnostic delay - the time gap between the first symptoms and the diagnosis - was as high as mean 42 days. A reduced diagnostic delay may improve both the survival rate and the clinical outcome. Often a PSI is mistaken for an episode of harmless low back pain in an in fact critically ill patient, or may be misinterpreted for another disease known to cause prolonged fever and unspecific symptoms.

VAS score was mean 60 (range 0-100) at follow-up. This result is difficult to deduce from due to the large span but as a mean value it may be considered as acceptable.

SF-36 was significantly lower than age-matched controls in all subscales. Again the dissimilarity in physical function

between the survey group and the age-matched controls has to be put in perspective to the multi-morbidity in this group of patients.

The increase in Barthel score postoperatively from 17.7 to 18.7 was non-significant so the patients were as independent of physical or verbal assistance after the operation as they were before. Almost half of the patients that had undergone surgery were using appliances to assist walking after the operation compared to 21% before the operation.

The moderately decreased score in the Mini Mental State Examination at follow-up (mean 26.6) indicates a moderate cognitive impairment in the study group. References to the MMSE test indicates that a score of 27 or less renders further investigation to rule out cognitive impairment. Whether or not this can be explained mainly by the PSI or by other factors such as age or other diseases cannot be concluded from the current study.

Results of the Tandem test, as a measure of balance, was markedly better in the survey group than in an age-matched control group from the literature. 100% of the patients treated surgically for a PSI were able to manage the side-by-side stand, and 67% were capable of performing the tandem stand as to 40% in the control group. The Timed up & go test, as a measure of functional mobility, was significantly lower in the survey group when compared to three out of four groups of healthy individual, and was mean 14.4 sec. It has in other studies been indicated that individuals who can perform the Timed up and & Go test within 10 seconds are freely independent in physical mobility [20,29]. The 30-second chair stand test, as a measure of lower body strength, was significantly lower than in the age-matched controls. Furthermore one out of three patients had to use the help of arms to be able to perform the test. Other studies have suggested that poor performance on the chair stand test, and thereby poor lower-limb functioning, is predictive of nursing home placement and mortality [7].

Concerning functional testing the current study indicates that patients treated surgically for a PSI are no worse of than healthy individuals when it comes to balance but as to functional mobility and lower body strength the survey group are not performing as well as the control group.

In conclusion PSI remains a severe disease with unspecific symptoms and a significant diagnostic delay in a population of elderly high-risk patients with extensive co-morbidity. When surgical treatment is indicated PSI has a high mortality rate but in these cases where conservative treatment proves insufficient the outcome in the surviving patients is considered acceptable.

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