

Treatment and outcome with traumatic lesions of the olecranon and prepatellar bursa: a literature review apropos a retrospective analysis including 552 cases

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Received: 11 August 2016 / Published online: 26 April 2017
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Abstract

Background Traumatic lesions of the olecranon bursa (OB) and prepatellar bursa (PB) are injuries commonly seen in orthopaedic trauma units. These injuries are associated with a high rate of complications. At present, only little is known about the incidence, complication rate, and treatment approaches in patients with acute open bursae.

Materials and methods A total of 552 patients who had been treated for acute traumatic lesions of either the olecranon bursa or the prepatellar bursa, or both at our department were retrospective identified in the years between 2009 and 2014. An analysis of the medical history of these patients was carried out to investigate the incidence of bursa injuries, circumstances, concomitant injuries, complication rate, and treatment approaches. In addition, a systematic literature search on PubMed was conducted.

Results The incidence of traumatic lesions of the OB or PB in trauma patients was 0.2% (198/100,000; 62% OB, 38% PB). Bursectomy was performed in 83.7%. Concomitant injuries were present in 41% of the cases, with no significant influence on the complication rate ($P = 0.367$). The overall complication rate was 19.7%. Revision surgery was necessary in 4.5% of the patients. No significant differences between OB and PB injuries were noted with regard to the complication rate ($P = 0.221$). There were also no

significant differences in the complication rate between patients who received bursectomy and those with conservative treatment ($P = 0.364$). Regression analyses showed that prophylactic antibiotic administration significantly reduced the risk of infection ($P = 0.04$).

Conclusions Traumatic lesions of the OB and PB are associated with a high risk of complications. Prophylactic antibiotic therapy can potentially reduce the risk of infection and the need for revision surgery.

Keywords Traumatic bursa lesion · Olecranon bursa · Prepatellar bursa · Antibiotic therapy in wounds · Bursectomy · Bursitis · Bursa

Introduction

Due to their superficial locations, the olecranon bursa and prepatellar bursa are highly susceptible to injury. Bursae are sac-like cavities, commonly located on the extensor side of joints. They provide a sliding layer to minimize friction during movement. At present, only little is known about traumatic lesions of the olecranon bursa (OB) and prepatellar bursa (PB). Although this type of injury is common in trauma patients, there are as yet no standardised, evidence-based treatment recommendations. The treatment approaches used vary from simple wound closure to surgical bursectomy or bursa reconstruction [1]. The aftercare provided is similarly heterogeneous, including splinting, bracing, or a simple bandage [1].

Open traumatic bursa lesions often result from considerable soft-tissue trauma, with gross contamination. Antibiotics are commonly prescribed in these cases. The influence of prophylactic antibiotic therapy on wound

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infection and other wound healing disturbances is a matter of ongoing debate [2].

The aim of this study was to investigate the outcome and complication rates as well as the epidemiological data in patients with traumatic lesions of the olecranon bursa and prepatellar bursa. Attention also focused on concomitant injuries and possible risk factors correlating with complications of these injuries. The influence of prophylactic antibiotic treatment on wound infection as a complication in patients with open bursae was also investigated.

Materials and methods

A keyword search using the terms “bursa”, “bursectomy”, “bursitis”, and “open bursa”, with different spellings, was performed for the years 2009–2014 using the PowerChart clinical information system (CIS) database (Cerner Millennium; Cerner Corporation, Kansas City, MO, USA). A total of 2761 patients were identified with at least one of the key words in their medical history. The electronic data for all of the patients’ histories were carefully reviewed by three reviewers. Patients who met the inclusion criteria were listed, and the medical history was reviewed again. The relevant data for these patients were extracted into an SPSS file (IBM SPSS Statistics for Windows, version 21.0; IBM Corporation, Armonk, NY, USA).

A total of 552 patients with either a traumatic lesion of the olecranon bursa (OB) or prepatellar bursa (PB), or both, were identified in the years 2009–2014. All patients with a traumatic open bursa (OB and/or PB) were included. Pathologies other than traumatic lesions of the OB or PB, such as septic/aseptic bursitis or postoperative complications, were excluded from the study. The frequencies and circumstances of the injuries, age, sex, time to admission, treatment approach, and complications were recorded. A retrospective analysis of these data, focusing on possible risk factors and complications, was performed using SPSS 21.0. Patients with an already infected wound situation with open OB or PB at presentation ($n = 16$) were included in the calculation of the demographic data, but excluded from the evaluation of the treatment approaches and complication rates. For the treatment variable “bursectomy”, no distinction was made between partial bursectomy (resection of the superficial layer only) and complete bilayer bursectomy.

Statistics

Continuous data are reported as median and range and categorical data as absolute and relative frequencies. Categorical variables were compared using Fisher’s exact test. On the basis of the distribution of continuous variables,

either a t test for independent samples or a Mann–Whitney U test was used to compare variables between defined groups. All statistical tests were two-sided, with a significance level of 5%. Several logistic regression models were implemented for the outcome variables “infection”, “complications/summary”, and “antibiosis”. Both clinically relevant variables and variables that were univariately associated with a P value <0.2 were considered for logistic regression analysis. The linear regression model was applied for the logarithmised variable “treatment duration”. All of the statistical analyses were performed using the SPSS 21.0 program.

Results

The study included 552 patients with traumatic lesions of either the OB or PB, or both. The incidence of traumatic acute open OB or PB was 0.2% per year (198 cases in 100,000 trauma patients per year). The OB was affected in 62.1% of the patients ($n = 343$) and the PB in 37.7% ($n = 209$).

Among these patients, 87.3% ($n = 482$) presented within the first 12 h after injury and 12.7% after a delay (>12 h, $n = 70$). In 2.9% ($n = 16$), the wound was already infected at the time of the delayed presentation. Most of the injuries occurred during the summer (40.5%, $n = 220$), with the fewest taking place during the winter (18.6%, $n = 101$). The circumstances of the injuries are illustrated in Fig. 1 and demographic data for the patients are listed in Table 1.

Bursectomy was performed in 83.7% of the acute bursa lesions; conservative treatment was administered in the remainder.

Concomitant injuries were present in 220 patients (41%); details of these are given in Table 2. These injuries did not have a significant influence on the complication rate or on the duration of treatment ($P = 0.270$ and $P = 0.367$, respectively).

The overall complication rate was 19.8% in patients with acute traumatic bursa lesions. Revision surgery was necessary in 21.7% of the patients with complications and 4.5% of all patients. The complications are listed in detail in Table 3. There were no significant differences between the regions affected (OB or PB) with regard to the complication rate ($P = 0.221$). The median time to the development of an infectious complication was 6.5 days (range 1–26 days). No significant differences were noted in relation to the complication rates between the patients who were treated conservatively and those who underwent bursectomy ($P = 0.364$). The complication rate in the group of patients treated with bursectomy (19.1%) was slightly lower than in the patients who were treated

Fig. 1 Percentage figures for the various causes of injury. The most common cause of injury to the olecranon bursa or prepatellar was a fall during everyday activities. Falls that took place at home are shown separately (domestic falls, including bathroom)

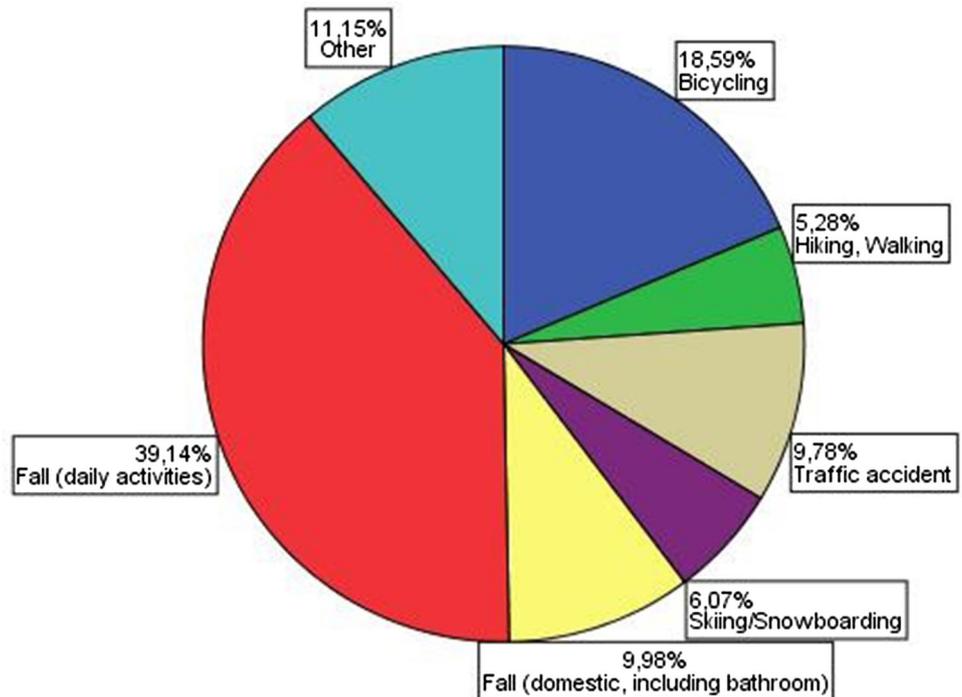


Table 1 Descriptive statistics for patients with acute olecranon bursa or prepatellar bursa with no signs of wound infection at presentation

	Initially uninfected patients (<i>n</i> = 536)
Age: median (range)	44 (7–93)
Male patients: <i>n</i> (%)	352 (65.7)
Patients with delayed treatment: <i>n</i> (%)	55 (10.3)
Elbow injuries: <i>n</i> (%)	329 (61.4)
Patellar injuries: <i>n</i> (%)	206 (38.4)
Overall complication rate (%)	19.8
Patients with antibiotic prophylaxis: <i>n</i> (%)	301 (56.2)
Duration of treatment in days: median (range)	14 (1–189)
Bursectomies: <i>n</i> (%)	457 (85.3)
Patients with in-patient treatment after bursectomy: <i>n</i> (%)	111 (20.7)
Cast immobilisation (%)	69
Median duration of cast immobilisation: days (range)	6 (1–42)

conservatively (22.6%). In the group of patients with a delayed presentation but with no sign of wound infection, the risk for any complication was slightly higher, at 29.1%. However, this difference was still not significant ($P = 0.075$).

Two regression models were calculated to assess the possible risk factors influencing the infection development and the duration of treatment. The first logistic regression model assessed the effects of age, patella and elbow

Table 2 Descriptive statistics on concomitant injuries in patients with open olecranon bursa or prepatellar bursa

	Initially uninfected patients (<i>n</i> = 536)
Concomitant injuries: <i>n</i> (%)	220 (41.0)
Contusion/distortion: <i>n</i> (%)	95 (17.7)
Fractures: <i>n</i> (%)	62 (11.6)
Other open wounds or excoriations: <i>n</i> (%)	64 (11.9)
Blunt brain injuries: <i>n</i> (%)	36 (6.7)
Multiple trauma: <i>n</i> (%)	17 (3.2)

Table 3 Details of complication rates in patients with open olecranon bursa or prepatellar bursa

	Initially uninfected patients (<i>n</i> = 536)
Complications: <i>n</i> (%)	106 (19.8)
Infections: <i>n</i> (%)	34 (6.3)
Wound healing disturbances: <i>n</i> (%)	36 (6.7)
Other: <i>n</i> (%)	47 (8.8)

“Other” summarises keloid scar formation, haematoma, seroma, recurrent bursitis, and swelling. The patients may have had one or more complications

injuries, bursectomy, other types of conservative therapy, and antibiotic prophylaxis on the likelihood of an infection developing. Increasing age ($P = 0.039$) was found to be associated with an increasing likelihood of infection

developing; increasing antibiotic prophylaxis ($P = 0.04$) was associated with a reduction in the likelihood of infection developing.

Multiple linear regression analysis was used to examine ways in which complications, cast immobilisation, bandage application, and bursectomy or conservative treatment might help to predict the duration of treatment. Complications that had developed, cast immobilisation, and bandage application statistically significantly predicted the duration of treatment [$F(4, 178) = 11.29, P < 0.001$]. These variables added significantly to the model ($P < 0.05$). Bursectomy or conservative treatment was not predictive of the duration of treatment.

The presence of a complication showed a quite strong positive correlation with the duration of treatment ($r_s = 0.430$). Conversely, cast immobilisation ($r_s = -0.198$) and bandage application ($r_s = -0.207$) showed only a weak negative correlation with the duration of treatment. These correlations were statistically significant.

Discussion

This study investigated 552 cases of traumatic lesions of the olecranon bursa (OB) and patellar (PB) bursa. These injuries are common in trauma patients, at 0.2% (198/100,000). The results show that the complication rate is quite high, at almost 20%, with no differences between the groups with acute open OB and PB. Bursectomy was performed in most of the patients. Logistic regression model indicated that prophylactic antibiotic therapy significantly reduces the risk of infection. The application of a cast or bandage for a few days may reduce the duration of treatment.

Although acute traumatic lesions of the OB and PB are commonly seen in trauma units, there is very little evidence concerning treatment approaches, outcome, and risk factors. A study evaluating the current treatment approaches used in Germany, Austria, and Switzerland showed a very heterogeneous range of therapies [1]. In the present study, bursectomy was performed in 84% of all cases and prophylactic antibiotics was administered in 56%. Patients with a delayed presentation (more than 12 h) tended to be treated conservatively. According to the survey by Baumbach et al., bursectomy is preferred more by trauma surgeons than by orthopaedic surgeons [1]. In Switzerland, only 49% of the physicians surveyed decided on bursectomy. In the present study, no significant differences between conservatively treated and surgically treated patients were observed with regard to the outcome and complications. Both treatment approaches may, therefore, be suitable. However, patients with a delayed presentation

or minor injuries are more likely to receive conservative treatment. It is still unclear whether bursectomy is more advantageous than simple wound debridement and closure or a conservative treatment approach. In this study, the overwhelming part of the patients was treated with bursectomy, and therefore, a bias might exist comparing the groups of patients with bursectomy and conservative treatment.

The overall complication rate was 19.8% in this retrospective analysis. The most common complications were infection and wound healing disturbances. The complication rates are comparable with those reported in the literature, which may be as high as 27% for wound healing disturbances and 22% for recurrences in patients with aseptic or septic bursitis [3, 4]. Most of the complications were manageable with conservative treatment. Revision surgery was necessary in 20% of the complications.

Antibiotic prophylaxis was administered in 56% of the cases in the present study. This rate is also comparable with literature reports evaluating the treatment approaches used in Austria, Germany, and Switzerland [1]. A recently published description of the treatment approach for traumatic lesions with an open patellar bursa recommended that antibiotic prophylaxis should only be administered in patients with risk factors or with grossly contaminated wounds [5]. However, the regression model in the present study shows that infectious complications are reduced in patients who receive prophylactic antibiotics. Randomised controlled trials taking into account risk factors and wound contamination are needed to fully resolve this issue. Antibiotic prophylaxis has been successfully used perioperatively [6, 7]. There is currently no conclusive evidence in the literature to support antibiotic therapy in patients with smaller wounds or lacerations [2].

Several limitations of the present study should be mentioned here. The patients were included in it retrospectively. Comorbid conditions that might influence the complication rate, such as diabetes, were not taken into account in the analysis. In some cases, aftercare was continued by a general practitioner. There may, therefore, have been some selection bias in favour of more complex cases, leading to overestimation of the complication rate. Some patients also received conservative treatment probably because they had minor wounds or less contamination. The damage to the soft tissue and the deepness of the wounds could not be addressed in this retrospective work. There might, therefore, also be some bias in relation to the complication rates in the group of patients treated conservatively. Furthermore, the type and dosage of the antibiotic therapy were not clear in every case. The value of prophylactic antibiotic therapy in open BO or BP has to be seen very critically.

Conclusions

This study shows that traumatic lesions of the olecranon bursa or prepatellar bursa are common injuries in trauma patients. These injuries may be associated with a high risk of complications. Bursectomy is the commonly performed therapy.

Considering the very low evidence available on this topic, a definitive treatment conclusion cannot be drawn yet. Further research in prospective studies is needed to fully and conclusively determine the best treatment strategies.

Compliance with Ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

References

1. Baumbach SF, Domaszewski F, Wyen H, Kalcher K, Mutschler W, Kanz KG (2013) Evaluation of the current treatment concepts in Germany, Austria and Switzerland for acute traumatic lesions to the prepatellar and olecranon bursa. *Injury* 44:1423–1427
2. Lane JC, Mabvuure NT, Hindocha S, Khan W (2012) Current concepts of prophylactic antibiotics in trauma: a review. *Open Orthop J* 6:511–517
3. Degreef I, De Smet L (2006) Complications following resection of the olecranon bursa. *Acta Orthop Belg* 72:400–403
4. Ogilvie-Harris DJ, Gilbert M (2000) Endoscopic bursal resection: the olecranon bursa and prepatellar bursa. *Arthroscopy* 16:249–253
5. Kaiser P, Schmidle G, Raas C, Blauth M (2015) Treatment concept for a traumatic lesion of the prepatellar bursa. *Oper Orthop Traumatol* 27(427–36):437–438
6. Platt R, Zaleznik DF, Hopkins CC, Dellinger EP, Karchmer AW, Bryan CS et al (1990) Perioperative antibiotic prophylaxis for herniorrhaphy and breast surgery. *N Engl J Med* 322:153–160
7. Classen DC, Evans RS, Pestotnik SL, Horn SD, Menlove RL, Burke JP (1992) The timing of prophylactic administration of antibiotics and the risk of surgical-wound infection. *N Engl J Med* 326:281–286