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ORIGINAL ARTICLE

Evaluation of current treatment regimens for prepatellar and olecranon bursitis in Switzerland

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Abstract
Purpose Bursitis is a common entity. However, evidence for the best treatment procedures is lacking, with management concepts varying internationally. We evaluated current treatment regimens for septic (SB) and nonseptic (NSB) prepatellar (PB) and (OB) olecranon bursitis in Switzerland and compared them to the published literature.
Methods A voluntary 23-item online survey was distributed amongst all registered Swiss infectiologists and orthopedic surgeons in December 2011. The literature comparison was based on a systematic literature review.
Results Overall response rate was 14 % ($n = 117$); 11 % ($n = 92$) were included in the final analysis. The overwhelming majority (91 %) of the respondents differentiated between SB and NSB, with determination predominantly based on clinical presentation (83 %), blood chemistry (75 %), and bursal aspirate (66 %). NSB was predominantly treated conservatively via immobilization (78 %) and anti-inflammatory medication (73 %). For SB, 85 % indicated surgical intervention, with 73 % prescribing concomitant antibiotics. Regarding antibiotic choice, 90 % used an aminopenicillin or its derivatives for a mean of 11 ± 5 days. The literature review revealed 66 relevant publications with an overall level of evidence of 2b, arguing for a conservative treatment approach in cases of SB or NSB.
Conclusion Therapeutic regimens for OB/PB differed considerably within Switzerland. Surgical intervention and antibiotic treatment was the most common therapy for SB, whereas a conservative approach predominated for NSB, which contrasts with the international literature. Clearly, prospective multicenter and multidisciplinary studies are needed to identify an optimal and cost-saving approach to the treatment of these common clinical entities.

Keywords Bursitis · Olecranon · Prepatellar · Septic · Nonseptic · Antibiotics

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Introduction

Acute olecranon (OB) and prepatellar bursitis (PB) are frequent entities with an estimated annual incidence of 10/100,000 cases, and are regularly treated by orthopedic surgeons, general practitioners, rheumatologists, or infectious disease (ID) physicians in hospitals and private practice [1–6].

Bursitis cases may be acute or chronic, nonseptic (NSB) or septic (SB). Two-thirds of all acute OB/PB cases are nonseptic. NSB is a sterile inflammation of the bursa, often triggered by repetitive trauma or mechanical overuse in certain

occupational groups (gardeners, carpenters, and students) and athletes (martial arts, volleyball, American football, or ice hockey) [7–9]. NSB is rarely caused by crystal deposition or systemic diseases, such as systemic lupus erythematosus, rheumatoid arthritis, or uremia [3, 7, 10].

In contrast, SB is an acute infection of the bursa that is mostly caused by small skin lesions [1, 7, 11]. Among the causative pathogens, 80–90 % are *Staphylococcus aureus*, followed by beta-hemolytic streptococci. In immunocompromised (diabetes, alcohol abuse, renal impairment, steroids, or malignancy [1, 3, 4, 11]) or nosocomial cases, other pathogens—including Gram negatives—may occasionally be witnessed.

Despite its high prevalence and incidence and its occurrence worldwide, evidence regarding the management of bursitis is limited. Whereas the literature favors a primarily conservative treatment approach for SB and NSB, German textbooks recommend surgical intervention in the case of SB [9, 12–15]. This is in line with recent recommendations by the Paul-Ehrlich-Gesellschaft, which lists SB as an infection requiring urgent surgical intervention [16]. According to personal experience and information related orally by colleagues, treatment concepts in Switzerland even vary within the same region, with more or less excessive regimens being performed. Moreover, there is no literature on the diversity of treatment regimens within a single country.

The aim of the current survey was a systematic voluntary evaluation of current treatment regimens amongst orthopedic surgeons and ID specialists in Switzerland for SB and NSB olecranon and prepatellar bursitis, and and to compare the results of this evaluation to existing literature.

Methods

Switzerland is a small federal country with roughly seven million habitants and three major linguistic regions (German-, French-, and Italian-speaking parts) with different medical cultures.

Online survey

A 23-item voluntary online survey (Fig. 1) on current diagnostic and treatment regimens for olecranon and prepatellar SB and NSB was conducted among all graduated Swiss ID physicians and orthopedic surgeons. E-mails containing a cover letter and link were mailed between December 10th and 19th 2011 to a total of 242 ID physicians and 585 orthopedic surgeons. Physicians were identified using the public databases of the Foederatio Medicorum Helvetorum, covering roughly 95 % of all graduated Swiss physicians. The survey was built using the Interview 123 5.5.b.e ND6 software (Interview, St. Martin d'Hères, France), and participants chose between a German- and a French-language version. The survey was online for one month.

The survey comprised five demographic questions evaluating the infrastructure of the participant's facility and the individual expertise of each responder. Two multiple-choice questions were used to survey the standard methods of diagnosing and differentiating NSB and SB. Treatment regimens were surveyed using two case reports with illustrations (Fig. 2). Open-ended questions allowed participants to provide free comments. Standard descriptive and comparative statistics were analyzed using SPSS Statistics 19.0.0 (IBM Company).

Literature search

A systematic literature review (Medline, Cochrane Library, and manual reference searches) was conducted to obtain insight into the available literature. Search terms were "bursitis" AND "olecranon*" OR "prepatellar*."

Results

Out of 827 physicians contacted, 117 (14 %) replied to the survey; 25 entries had to be excluded due to missing data. Finally, 92 (11 %) replies were included in the final analysis. The demographic details are summarized in Table 1.

Diagnosing and differentiating NSB and SB

Figure 3 illustrates the predominant diagnostics performed when a bursitis is suspected. The overwhelming majority (91 %) of the respondents differentiated between SB and NSB. Differentiation was predominantly based on clinical presentation (83 %), blood sampling (75 %), microbiological bursal fluid culture (70 %), and bursal aspirate (65 %). Less than 50 % differentiated by Gram staining (49 %) or microscopic repartition (44 %) of the aspirate.

General treatment regimen

Figure 4 summarizes the treatment options for SB and NSB, as well as significant differences between the treatment regimens surveyed. None of the respondents reported insecurity about their choice of treatment concept; neither did anybody report particular adverse event following their individual choice. A Pearson's chi-squared test revealed a significant difference between the overall management of SB and NSB ($p < 0.001$). Interviewees who choose bursectomy as a treatment option were asked to specify whether they perform a one-stage

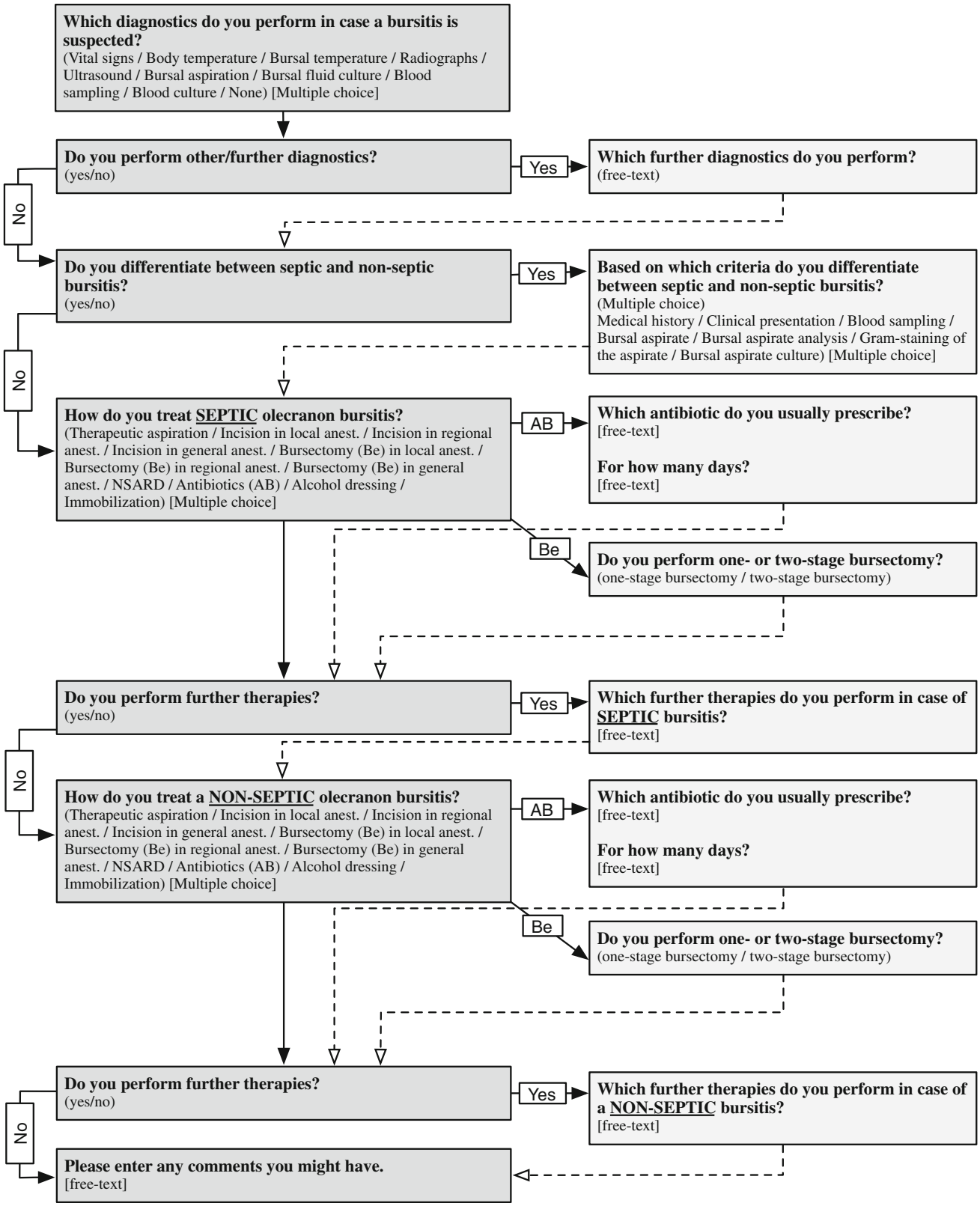

Fig. 1 Flow chart for the questionnaire

Fig. 2 Illustrations used in case studies for septic and nonseptic bursitis

Table 1 Summary of demographics

Center	
Level III	18 %
Level II	15 %
Level I	25 %
Level I (university)	41 %
Age (years; mean ± SD)	45.8 ± 10.4
Gender (% male)	86 %
Work experience (years; mean ± SD)	18.2 ± 10.3
Hierarchy of surgeon	
Resident	10 %
Attending	24 %
Senior physician/surgeon	43 %
Head of department	23 %

Level I hospital of maximum care (e.g., university teaching hospital), *level II* regional hospital, *level III* hospital of basic care

(SB 69 %/NSB 77 %) or two-stage (SB 31 %/NSB 24 %) bursectomy. Participants were also asked to specify the anesthesia used in the case of surgical intervention; these data are presented in Table 2. Four physicians conducted intraoperative biopsies and secondary bursectomy following acute inflammation in the case of SB. Steroid injection in the case of NSB was mentioned by one physician.

Antibiotic treatment

Among all of the ID physicians and orthopedic surgeons surveyed, 73 % included antibiotics in their treatment regimen for SB. Almost 90 % prescribed penicillin [amoxicillin/clavulanate (81 %), flucloxacillin (5 %), amoxicillin (1 %), or penicillin M (1 %)], and 6 % indicated that the patient should be started on a first- or second-generation cephalosporin for a mean duration of 11 ± 5 days (range: 3–28 days). Very rarely, ciprofloxacin and clindamycin were indicated as the antibiotics of choice.

For NSB, antibiotics played a subordinate role (6 % of all interviewees); amoxicillin/clavulanate was the only antibiotic mentioned, and it was prescribed for a mean of 10.5 ± 6.1 days.

Literature search

The literature search revealed 66 relevant publications (to January 2012) and no Cochrane review. The overall level of evidence was limited, and did not exceed level of evidence 2b (Oxford Center of Evidence-Based Medicine, March 2009). Treatment concepts seemed to vary considerably internationally. Importantly, the final microbiological and functional outcome did not seem to be affected by the initial regimen, with cure rates with primary intention of roughly 95 % among immunocompetent young patients and much lesser incidences for nosocomial cases in immunosuppressed individuals with a panoply of comorbidities [9, 12–14]. A primarily conservative approach for SB and NSB is favored in the literature. The German-language literature recommends a rather conservative approach for NSB [9, 12–14], but argues for immediate bursectomy accompanied by antibiotics and immobilization for SB [12–15]. No data regarding variations within a particular country were identified. Based on the data available, the authors developed a best-evidence treatment proposal, which is presented in Fig. 5.

Discussion

We performed a systematic nationwide online survey amongst Swiss orthopedic surgeons and ID physicians regarding the current treatment regimens for septic and nonseptic olecranon and prepatellar bursitis, and found that various diagnostic and therapeutical approaches were employed within this small country. Importantly, despite the fact that different procedures were performed, all of the

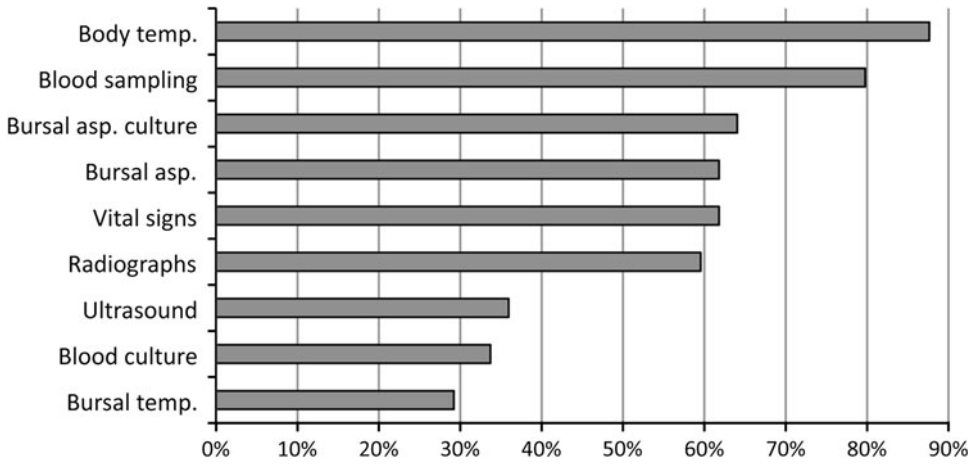

Fig. 3 Diagnostics performed in cases of suspected olecranon or prepatellar bursitis. *temp.* temperature, *asp.* aspirate, *Bursal temp.* temperature measured over bursa

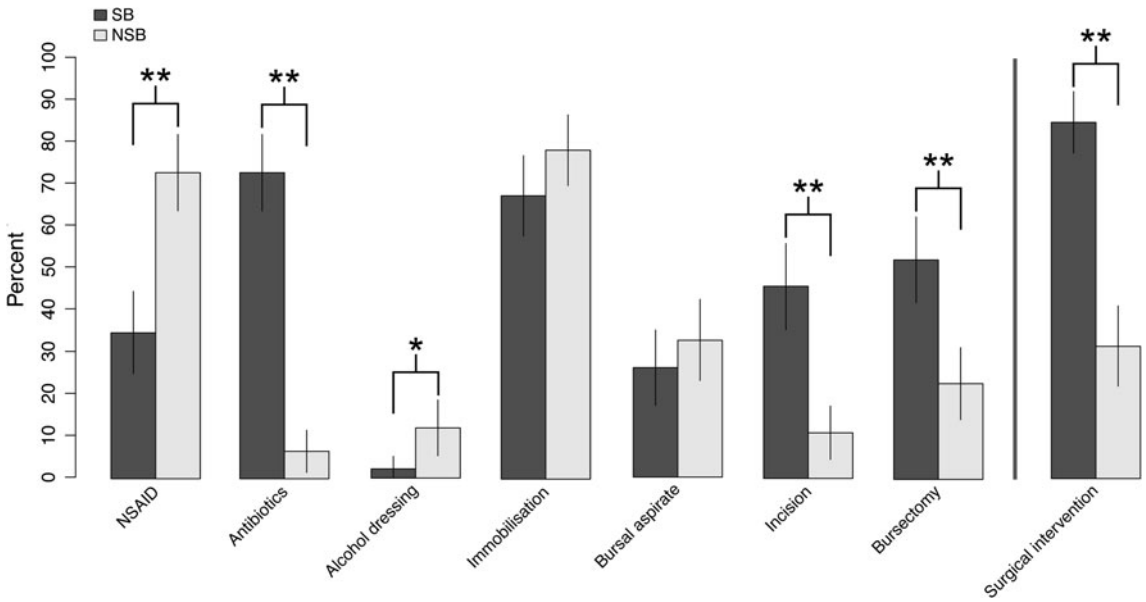

Fig. 4 Treatment options listed for septic and nonseptic bursitis. * $p < 0.05$; ** $p < 0.001$. *Surgical intervention* refers to physicians who indicated that they perform a bursectomy and/or incision

surveyed colleagues appeared to be confident about the treatment they chose, since they did not reported otherwise.

The initial diagnosis of SB and NSB and differentiation between them was important for most colleagues. Only 9 % did not attempt this differentiation, which may lead to excessive surgeries and antibiotic use in many cases. According to the data acquired, body temperature, blood sampling, bursal aspirate, vital signs, and radiographs were the standard diagnostics performed by more than half of the surveyed colleagues. Differentiation was predominantly based on clinical presentation, blood chemistry and blood cultures, bursal aspirate, and bursal fluid culture. However, in the literature, clinical presentation (i.e., bursal swelling, redness, and tenderness) was not found to be suitable for differentiating between SB and NSB according to various studies [7, 10, 17, 18]. Based on the evidence available, initial differentiation should be based on bursal temperature, bursal fluid analysis (white cell count, glucose, polymorphonuclear cell count), Gram staining, and gross aspirate characteristics [2, 7, 10, 17, 18], all of which were mentioned by less than 50 % of our Swiss colleagues. We could not identify the precise reason for this discrepancy. Indeed, Switzerland seems to rely more on clinical presentation than on additional exams. Although this may initially spare time and costs, differentiating between SB and NSB is the key to providing adequate treatment.

The importance of initial differentiation was reflected in the significant differences in the treatment regimens surveyed herein. For NSB, a primarily conservative treatment approach predominated, whereas a combination of antibiotics, immobilization, and bursectomy was favored for SB. One-third of the Swiss colleagues interviewed indicated that

Table 2 Anesthesia procedures used for surgical intervention

	SB		NSB	
Anesthesia	Bursectomy[a]	Incision[b]	Bursectomy[c]	Incision[d]
General	33	17	11	2
Regional	24	23	12	6
Local	0	11	2	5

[a] Duplications: General + Regional: 9

[b] Duplications: General + Regional: 6; Regional + Local: 1; General + Regional + Local: 1

[c] Duplications: General + Regional: 3; Regional + Local: 1

[d] Duplications: General + Regional: 1; Regional + Local: 1

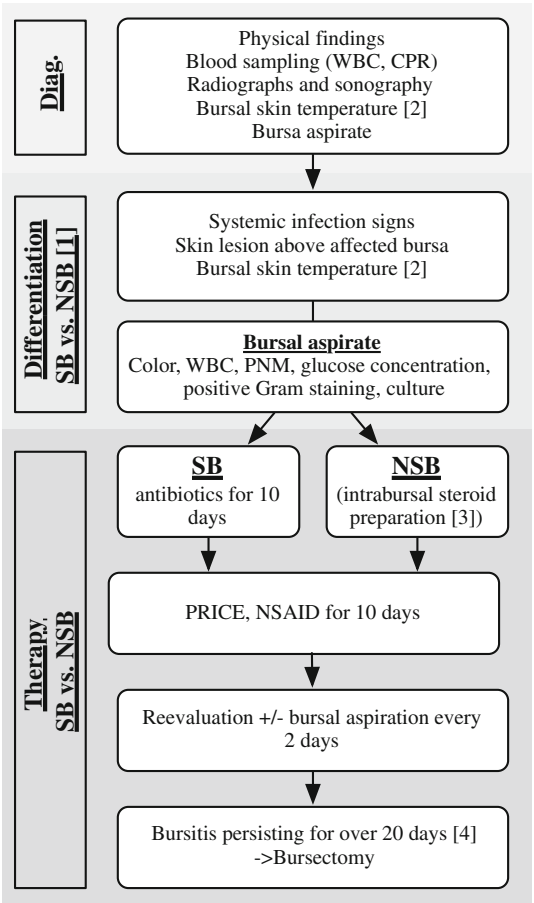

Fig. 5 Proposed best-evidence treatment approach for septic and nonseptic olecranon and prepatellar bursitis. *Diag.* diagnostics, *SB* septic bursitis, *NSB* nonseptic bursitis, *WBC* white blood cell count, *PNM* polymorphnuclear cells, *PRICE* protection (immobilization), rest, ice, compression, elevation. *[1]* variables used to differentiate between SB and NSB, *[2]* difference in skin temperature between the affected and unaffected bursa, *[3]* intrabursal steroid injection is only indicated if NSB is verified by culture, *[4]* number chosen arbitrarily by the authors

surgical intervention was a viable treatment option in the case of NSB, and 24 % of these even considered a two-stage procedure. The high frequency of surgical interventions contrasts with the international literature, but is in line with contemporary German-language textbooks [12, 13, 15]. The international literature argues for conservative treatment in cases of SB and NSB [7, 19, 20], comprising serial bursal aspiration, PRICE schema, anti-inflammatory medication for NSB [12, 13, 15], and additional antibiotics for SB [3, 7, 9, 14, 17, 20, 21], with high success rates and few complications reported. To cite two examples, García-Porrúa et al. [11] successfully applied a nonsurgical treatment approach with serial bursal aspiration and antibiotics to 75 patients with SB. A secondary bursectomy due to the failure of the initial conservative treatment was necessary in only 5 %. A comparable regimen was used by Martinez-Taboada et al. [5] on 82 patients with SB, although 12 % required secondary surgical intervention.

According to the literature, surgical intervention is only recommended in cases of failed conservative treatment, critically ill patients, or in cases with complications [3, 4, 14, 22]. However, the ideal surgical approach is unknown. Roughly speaking, there are three possibilities: drainage by incision or one-stage or two-stage bursectomy (bursectomy and closure at the same/different intervention). According to this survey, around 30 % of Swiss orthopedic surgeons and/or ID physicians indicated two-stage bursectomy as a treatment option. Categorizing SB as an abscess would argue for secondary wound closure. A study is currently investigating the cost savings and outcomes of a one-stage bursectomy compared to a two-stage bursectomy in hospitalized patients with severe olecranon or prepatellar bursitis (NCT01406652, Geneva University Hospitals).

In cases of confirmed NSB, intrabursal steroid injection is a further treatment option, although it was mentioned by only one physician. Smith et al. [18] conducted the only randomized controlled trial on this treatment option and found a faster decrease in swelling and fewer re-aspirations for intrabursal methylprednisolone injections compared to oral naproxen or oral placebo in 42 male patients with NSB, which is in line with orther studies [3, 23]. Although Smith et al. [18] reported no complications, other authors have, including skin atrophy, chronic local pain, or infection [3, 20, 23].

Interestingly, antibiotics were considered a treatment option for SB by 73 % of all surveyed colleagues, which might indicate that concomitant antibiotics are not necessary for the immunocompetent when the infected bursa is removed completely. Further research is undoubtedly required to define the patients who need concomitant antibiotics. When it comes to the choice of antimicrobial regimen, nearly 90 % of the surveyed colleagues favored amoxicillin/clavulanate, and only 6 % chose a first- or second-generation cephalosporin. The literature advises antistaphylococcal/antistreptococcal antibiotics [17, 24–26], such as penicillinase-resistant penicillin (e.g.,

fluclaxacillin) or a first-generation cephalosporin (e.g., cefazolin) [1, 3, 4, 7, 10, 17, 20, 26], unless Gram stain or other factors (e.g., allergies to antibiotics) suggest otherwise [22]. Considering that more than 95 % of bursitis pathogens are methicillin-sensitive cocci (*S. aureus*, streptococci), this coverage is certainly good, but it may be extensive. Importantly, the large anaerobic and Gram-negative coverage of amoxicillin/clavunalate is unnecessary for routine bursitis cases and could be easily replaced by an oral cephalosporin; on the other hand, the relative cheap acquisition costs and the widespread use of amoxicillin/clavulanate for erysipelas in Switzerland suggest that getting surgeons and physicians to change to antibiotics with narrower spectra in routine bursitis cases will not be easy.

Reducing the use and spectrum of an antibiotic use is easier to achieve by reducing the duration of administration. The reported mean duration of antibiotic administration, 11.0 ± 5.1 days, is congruent with the literature on patients presenting with mild to moderate SB [3, 5, 17, 20, 22, 25, 27]. However, we detected a huge variation (3–28 days) for operated cases, not to mention the 27 % of colleagues who do not routinely use antibiotics. Indeed, in the largest case–control study on this topic, Perez et al. [6] showed that cure rates in immunocompetent patients treated for 7 days were equivalent to those treated in patients treated for 14 or 21 days. Consequently, many colleagues could shorten the prescribed duration of antibiotic administration without compromising the safety of their patients.

Our survey has several limitations. First, the survey was voluntary in nature and had a response rate of 14 %, which was lower than reported for comparable studies [28, 29]. A reminder might have resulted in a higher return rate, but a possible bias from duplicate answers may have been introduced. Nevertheless, noting that 66 % of the surveyed physicians and surgeons were opinion leaders within their institutes (division chief/head of department) and worked at university hospitals, the authors believe that this survey accurately reflects current diagnostic and treatment regimens for olecranon and prepatellar bursitis in Switzerland. Second, their was no differentiation between orthopedic surgeons and ID physicians. Third, general practitioners and rheumatologists were not included in the survey.

Conclusion

Even in a small country such as Switzerland, diagnostic and therapeutic approaches for the common entities of septic and nonseptic olecranon and patellar bursitis showed great heterogeneity. While the international literature predominantly argues for conservative approaches to both NSB and SB, Swiss orthopedic surgeons and ID physicians favor a surgical approach in the case of SB. However, a substantial fraction of the NSB cases were also treated surgically with primary intention. Adopting a more conservative treatment approach might lead to considerable cost savings and a reduction in hospital admissions. Amoxicillin/clavulanate was the predominant antibiotic therapy employed in NSB/SB cases in Switzerland. Although its coverage is certainly good, it may be too extensive for most cases of bursitis. Besides moving to a narrower spectrum, it may also be possible to reduce the duration of antibiotic administration to roughly 7–10 days, as advocated in the literature. Finally, an optimal treatment algorithm is still lacking, and would ideally necessitate prospective multicenter and multidisciplinary trials.

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Conflict of interest None.

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