

Management of Septic and Aseptic Prepatellar Bursitis: A Systematic Review

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Abstract

Background

Despite contributing to significant morbidity in working age adults, there is no consensus on the optimal treatment for prepatellar bursitis. Much of the existing literature combines prepatellar and olecranon bursitis. This systematic review aims to determine the optimal management of prepatellar bursitis.

Study design and methods

A primary search of electronic published and unpublished literature databases from inception to November 2019 was completed. Articles over 25 years old, case reports with less than four patients, paediatric studies, and non-English language papers were excluded. Our primary outcome was recurrence after one year. Comparisons included endoscopic vs open bursectomy, duration of antibiotics. Methodological quality was assessed using the Institute of Health Economics (IHE) and Revised Cochrane Risk of Bias (RoB-2) scoring systems. Meta-analyses were conducted where appropriate.

Results

In total 10 studies were included (N=702). Endoscopic and open bursectomy showed no difference in recurrence after one year (OR=0.41, 95% CI 0.05-3.53, p=0.67), and surgical complications (OR=1.44, 95% CI 0.34-6.08, p=0.44). 80% endoscopically-treated patients were pain free after one year. Patients treated with antibiotics for less than eight days were not significantly more prone to recurrence (2/17 vs 10/114, OR 0.66, 95% CI 0.13-3.29, p = 0.64) compared to eight days plus at minimum one year post injury.

Conclusions

Our study represents the largest cohort of patients evaluating management strategies for prepatellar bursitis, and includes data not previously published. Endoscopic bursectomy is non-inferior to open bursectomy, enabling a shorter hospital stay. It also offers a relatively low risk of post-operative pain. Endoscopic bursectomy is a viable option to treat both septic and aseptic prepatellar bursitis. Our small cohort suggests recurrence and hospital stay are not improved with antibiotic treatment exceeding seven days for septic prepatellar bursitis.

Introduction

Bursitis is a common cause of morbidity, with a minimum population incidence of 10 per 100,000 [1]. It is defined as inflammation of a bursal sac with swelling and thickening of the bursal walls [2], with the most common forms documented as olecranon and prepatellar bursitis. The prepatellar bursa comprises two anatomically distinct regions, the subcutaneous prepatellar bursa and the superficial infrapatellar bursa [3]. Prepatellar bursitis is most prevalent in working age men [4], causing significant non-productive time [5], with studies documenting a prevalence of 10% in carpet layers and coal miners [6].

Baumbach et al [7] documented 36 different treatment modalities for bursitis in Switzerland alone in 2013. Treatment is commonly divided by aetiology, separating septic and aseptic bursitis, with most cases amenable to non-operative treatment. This is reflected in two treatment algorithms devised for olecranon and prepatellar bursitis [8] [9]. Baumbach advocates aspiration, with antibiotics for septic bursitis followed by re-evaluation every two days. If septic bursitis persists for over 10 days, or aseptic persists for 20 days, they recommend bursectomy. Khodae [9] also advocates aspiration in most cases, with surgical intervention for non-resolving bursitis.

Open bursectomy has been the mainstay in surgical management [10]. However, as many as 20% open bursectomy cases are associated with skin complications [11]–[13]. Most open bursectomy techniques involve a longitudinal incision over the bursa, where there is a tenuous blood supply, increasing the risk of necrosis and wound dehiscence [12]. Poor perfusion to this area is exacerbated by stretching of the skin following a period of bursal swelling [14], and long-term tenderness of the surgical scar can result from damage to the infrapatellar nerve [15], [16]. Endoscopic bursectomy reduces the risk of damage to the infrapatellar nerve by smaller incisions placed laterally and medially. Various techniques have been suggested to avoid these complications, from minimally invasive percutaneous tube placement [17] to sole excision of the posterior prepatellar wall [15]. Endoscopic bursectomy for traumatic bursitis was first described by Kerr and Carpenter in 1993 [18]. Endoscopic bursectomy has since been evaluated for a number of patient populations including septic and aseptic bursitis, and for a variety of operative techniques [10], [13], [14], [16], [19]–[23].

Septic bursitis represents around one third of all olecranon and prepatellar bursitis cases [24]. Septic bursitis patients are typically younger, and present earlier than aseptic bursitis [11]. Infective bursitis has been associated with skin breakage, trauma, and occupational risk factors [25]. Interestingly, these risk factors have been more pronounced in prepatellar than olecranon bursitis.

Staphylococcus aureus (*S aureus*) is the most common pathogen in septic bursitis, representing around 80% cases [10], [11], [25]–[28]. Treatment recommendations have evolved from up to four weeks of IV antibiotic therapy [26], to include oral outpatient treatment regimes.

This systematic review aims to determine the optimal treatment for prepatellar bursitis. Much of the existing literature combines prepatellar and olecranon bursitis into one study cohort, and there is no current agreement on the optimal management of prepatellar and olecranon bursitis even when considered together. We will assess both aseptic and septic prepatellar bursitis, operative techniques with a focus on endoscopic vs open bursectomy, and will investigate the use of antibiotics in septic prepatellar bursitis.

Method

Search Strategy

A primary search was performed of the electronic published literature databases AMED, BNI, CINAHL, EMBASE, EMCARE, HMIC, MEDLINE, PsycINFO, and Pubmed using HDAS. The Cochrane Registry of Clinical Trials, PEDro, and TripPRO were also searched. Following this, unpublished literature databases including clinicaltrials.gov, the ISRCTN and the NIHR trial portfolio were searched. The search terms used are shown in *Appendix 1*, with the search results in *Figure 1*. All databases were reviewed from their inception to the November 2019. Search results were reviewed by three authors (OB, MB, and TP) and any disagreement was adjudicated by a third author (CH) for all potentially eligible studies. Finally, the corresponding authors of all included studies were contacted to ask whether additional results were available.

Eligibility Criteria

Inclusion criteria:

- Patients with prepatellar bursitis
- English language

Exclusion criteria:

- Case reports or case series involving 3 or fewer patients
- Paediatric studies (patient cohort <16 years)
- Articles more than 25 years old
- Conference proceedings or poster presentations
- Book chapters
- Papers that did not separate prepatellar from olecranon bursitis in results, and where the authors were not contactable to obtain the relevant data.

Outcome Measures

The primary outcome was recurrence of bursitis, with primary end-point at over one year post treatment. Secondary outcomes were defined as: recurrence of bursitis, surgical complications, operative time, total duration of antibiotics, hospital stay, subjective rating, duration of IV antibiotics, change in range of motion, time to return to work, and pain at follow up. Outcomes were analysed as either short-term (inpatient stay to 90 days post-discharge), intermediate-term (three months to six months), and longer-term (six months onwards).

Data Extraction

Data were collected by one reviewer (OB) and verified by two others (MB, TP). Where disagreement in data collection occurred, this was resolved through discussion and adjudicated by a third author (CH). Data extracted included: cohort mean age; gender mix; whether septic/aseptic bursitis; severity of bursitis; antibiotics prescribed; presence of immunocompromised patients; timing of follow up; details of the operative procedure; post op management; adjacent treatments administered; and the outcomes of interest. Meric [29], Mathieu [30], and Raas [31] were excluded as we were unable to obtain data on prepatellar bursitis patients separately.

Quality assessment

All included studies were assessed with quality assessment tools. The Institute of Health Economics (IHE) quality appraisal checklist for case series studies [32] [33] was used to assess ten case series, and the Revised Cochrane risk-of-bias tool for randomised trials (RoB-2) [34] was used to assess one randomised clinical trial [35]. Cases of disagreement between the two reviewers (OB, TP) were resolved through discussion and adjudicated by a third reviewer (MB). The IHE checklist contains 20 questions, with answers yes, no, and partial

or unclear. We gave one point for a 'yes' response, 0.5 points for a 'partial/not applicable' response, and 0 for a 'no' response to generate an overall score for each paper. The RoB-2 checklist assesses risk of bias from randomisation; deviations from intended interventions; missing outcome data; outcome measurement; selection of results; and overall.

Data analysis

Heterogeneity existed between included studies in terms of outcomes assessed, timing of assessment, and statistical analysis presented. Furthermore, cohorts assessed included septic and non-septic patients, and bursectomies done acutely and for recalcitrant bursitis. When studies were homogeneous, data were pooled and analysed as a pooled through meta-analysis. Odds ratios (OR) (defined as the ratio of the probability of an event occurring in an exposed group to the probability of the event occurring in a comparison, non-exposed group) and 95% confidence intervals (CIs) for dichotomous outcomes, and mean differences (MD) (defined as the average of the absolute values of the $n(n-1)/2$ differences that exist between pairs in a statistical distribution of n elements) and 95% CIs for continuous outcomes, were calculated. For pooled continuous data for outcomes measured in scales, the standardised mean difference (SMD) and 95% CIs were calculated. For incompletely reported data or outcomes, study authors were contacted to request further data. All analyses were performed using IBM SPSS version 25 (IBM Corp, New York, USA).

Results

Studies and outcomes

Following duplicate removal, 424 records were screened, with 10 papers included in the final review. *Figure 2* outlines our search results. Mathieu [27], Meric [29], and Raas [31] were excluded from the final review as they did not separate cohorts of prepatellar and olecranon bursitis, and we were unable to obtain data on prepatellar bursitis alone from the authors. One stage versus two stage bursectomy, and antibiotic combination outcomes were not included as they each contained data from one source only. Demographic data for all included studies can be seen in *Table 3*.

Quality of evidence

Methodological quality assessments using the IHE checklist are shown in *Table 1*, with total scores ranging from 8-15 points (median = 11). Kaalund [16] had lapses in characterisation of patients included, eligibility criteria, statistical tests, estimates of random variability, and losses to follow up; but clearly defined the intervention and the conclusions were supported by the results. This paper was deemed just adequate as a result. Other papers had higher scores, and were deemed adequate using this scoring system. The RoB-2 tool was used to assess Uckay [35], resulting in an overall low risk of bias assessment (*Table 2*). The authors had taken adequate steps to blind the assessors to the randomisation outcome and the results were well structured.

Endoscopic versus open bursectomy

Primary outcome:

Recurrence of bursitis was reported in eight papers, five with endoscopic cohorts, and three with open bursectomy cohorts (*Table 4*). Long term recurrence, measured over one year after procedure, was demonstrated in 6/87 endoscopically treated patients and 1/34 open bursectomies. These were not significantly different (OR 0.41, 95% CI 0.05 – 3.53, $p=0.67$). 1/17 suffered short-term recurrence (less than three months) in the endoscopic group versus 5/51 in the open group (OR 1.74, 95% CI 0.19 – 16.03, $p=0.62$).

Secondary outcomes:

There was no significant difference in the complication rate between endoscopic (6/104), and open (3/38) bursectomies (OR 1.44, 95% CI 0.34 – 6.08, $p=0.44$). This analysis was conducted by raw number of complications across the total number of patients in the endoscopic and open cohorts.

Mean operative time was 18.8 minutes, in two of the endoscopic cohorts. The averages were 18+/- 5.6 minutes in 60 patients for Huang [22], and 25 minutes in eight patients for Dillon [10]. These were not pooled as raw data was not available. Open operative times were not recorded by any paper.

Mean hospital stay was 3.67 days (range 0-9 days) in the endoscopic cohort. In the open group, mean hospital was 6.6 days overall. Range of motion was normal at follow up in 83/83 patients who underwent an endoscopic bursectomy, vs 33/34 (97%) for open bursectomy. Pain at follow up was only reported in the endoscopic group. Pooled results for the endoscopic cohort at a follow up of 7-87 months showed 80% patients were without pain post op.

Operative vs non-operative from septic and non-septic cohorts

This was the largest cohort, with Stell [11] and Martinez-Taboada [36] in the non-operative septic group; Perez [26], Lieber [37], Uckay [35], Kaalund [16], Dillon [10], and Meade [14] in the septic operative group; Stell's

[11] aseptic patients treated non-operatively; Ogilvie-Harris [13] and Huang [22] in the operative aseptic bursitis group. Results are summarised in *Table 5 and 6*.

Primary outcomes:

Recurrence at one year was measured by Uckay 2017 [35], found in 2.94% septic operated on patients. No other papers measured recurrence at one year specifically.

Secondary outcomes

For septic patients, recurrence in the non-operative cohort was 2/27 (7.41%) versus 7/120 (5.83%) for the operative cohort (*Table 5*). These were not statistically different (OR 0.99, 95% CI 0.20 – 4.95, $p=1.00$). For patients with aseptic bursitis, the operative cohort had 5/79 recurrences (6.33%), and the non-operative 2/7 (28.57%). These were also not statistically different (OR 0.17, 95% CI 0.03 – 1.10, $p=0.10$) (*Table 6*).

Mean hospital stay in the non-operative septic cohort was 8.7 days (SD 9.06) versus 6.6 days in the operative septic cohort (*Table 5*). There was no result reported in the aseptic non-operative or operative cohorts. The rate of *S. Aureus* in the entire reported prepatellar bursitis patient cohort was 48/61 patients (78.7%).

Duration of antibiotic

We compared patients treated for less than eight days, with those treated for eight days or more (*Table 7*).

Primary outcomes:

Recurrence was demonstrated in two of 17 patients treated with antibiotics for less than eight days, compared to 10/115 patients treated for eight days or more. No significant difference was found between these groups using A 2-sided Fisher's exact test (OR 0.66, 95% CI 0.13-3.29, $p = 0.64$).

Secondary outcomes

Mean hospital stay was 7.8 days in the less than eight days cohort versus 8.3 days in the over eight days cohort. No statistical analysis was able to be performed for this comparison as raw data could not be obtained.

Discussion

This study represents the largest cohort of prepatellar bursitis patients to our knowledge. By producing the largest comparison of endoscopic versus open bursectomy for prepatellar bursitis, we can conclude that endoscopic bursectomy is non-inferior to open bursectomy regarding recurrence and complication rates. This safe and effective procedure enables short hospital stay and minimal post-operative pain.

Improved patient morbidity is frequently cited as a reason for endoscopic bursectomy. Our results were in line with this. In the endoscopic group, all patients had normal range of motion at follow up and had returned to work at a maximum of three weeks. Furthermore, three studies with patients treated endoscopically showed that 80% patients surveyed at 7-87 months had no pain post-operatively. In the open group however, one patient suffered reduced ROM at follow up and Uckay's [35] cohort had not returned to work at three weeks. Pain was unfortunately not reported in the open bursectomy patient cohort, and this has not been studied for open prepatellar bursectomies alone previously to our knowledge. Endoscopic bursectomy was associated with reduced pain and improved patient satisfaction in Meric's comparison of open and endoscopic bursectomy for both prepatellar and olecranon bursitis. Endoscopic bursectomy may be superior to open bursectomy, but further research is required to evaluate this.

The technique used in endoscopic bursectomy has evolved from the first description by Kerr and Carpenter in 1987 [18], and the papers in this review offer anecdotal advice to guide further advances. They advocate inserting the arthroscope at least 1cm away from the bursal skin to prevent bursal collapse, as well as directing the shaver tip away from the joint surface to prevent injury to the subcutaneous tissue [13], [23]. Pressure pumps used in this trial ranged from 35mmHg [13] to 40-50mmHg [14], with tourniquet use and complete bursal resection defined as subcutaneous skin seen superficially and fibres of patellar tendon seen distally [13]. Comparing operative technique between studies would be an interesting topic for further research.

Our largest comparison, comprising 223 patients, showed no significant difference in recurrence rates or hospital stay between operative and non-operative management for septic and aseptic bursitis. However, many patients underwent operative management when non-operative management failed resulting in recurrence. The rate of recurrence in operative patients was 5/79, including those non-operative treatment was unsuccessful. This indicates that operative management is beneficial in patients with recalcitrant bursitis.

Previous studies have indicated that 11 to 12 days is the ideal treatment time for septic bursitis [38], [39]. Raas' [31] comparison of 552 olecranon and prepatellar bursitis patients indicated that the median time for an infectious complication to manifest was 6.5 days. As a result, the ideal time to commence treatment is inherently complicated. This study indicates that a shorter course of antibiotics is feasible, as recurrence was not significantly different between patients treated with antibiotics for less than eight days compared to eight days or more. In fact, hospital stay was increased in patients treated for over 14 days, though this may be accounted for by greater use of oral antibiotics in those treated for less than 14 days. We recognise that this data is confounded by the heterogeneity of reporting times between the data sets, particularly from Martinez-Taboada's [36] cohort where no mention was made of the chronicity of measurement. Further research is required to confirm that seven days of antibiotic treatment is adequate for septic prepatellar bursitis. Data from the multi-centre OVIVA trial demonstrated non-inferiority for orthopaedic infections treated with oral vs IV antibiotics [40]. As such, the pertinent question for further research may not be the total duration of antibiotics but the possibility to treat septic prepatellar bursitis with oral antibiotics.

The rate of *S aureus* bursitis in the septic bursitis patients has been well-documented in previous studies, ranging from 80% - 88% [4], [28], [41]. Information is not widely available for prepatellar cohorts alone. Of four studies reporting rates of staph aureus in prepatellar bursitis, it was isolated in an average of 78.69% patients. This is somewhat lower than figures for septic bursitis as a whole, and may represent the contaminated workplace environment that prepatellar bursitis is associated with.

This review presented with strengths and limitations. The principal strength is that the data analysed arises both from published articles, and through communication with authors of select trials to isolate the results for prepatellar bursitis. We were able to obtain previously unpublished data on this selective cohort which has been presented here, and enables comparison between trial cohorts for prepatellar bursitis alone. The principle limitations are the heterogeneity and size of our study sample, and the inability to obtain raw data from all studies. Meric [23] compared open bursectomy with endoscopic bursectomy for prepatellar and olecranon bursitis, but results for prepatellar bursitis patients alone were not available.

Heterogeneity in follow up time led to potential chronicity reporting bias for our data sets. Some reported follow up at one year, while others had follow up periods much shorter than this, and no mention of follow up time was made with others. We recognise that this is a limitation to our results, and that further research will enable greater statistical power for comparison. We were not able to compare septic and aseptic bursitis, as the time periods where recurrence was measured varied. Aseptic bursitis recurrence was measured at over one year post injury, whereas septic bursitis was measured much sooner than this making this comparison invalid.

Conclusions

This study is the largest investigating prepatellar bursitis, and includes data not previously published. We conclude that endoscopic bursectomy is a safe and effective treatment for prepatellar bursitis. Operative management should be considered for recalcitrant aseptic bursitis, but has not been shown to be superior to non-operative management for septic bursitis. We have found no advantage in recurrence or hospital stay with antibiotic treatment lasting over one week in septic prepatellar bursitis, but recognise that this requires further research.

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Tables and Figures

	18	Adverse events reported?	1	1	1	0	1	1	0.5	1	1
	19	Conclusions of the study supported by results?	1	1	1	0.5	1	0.5	1	1	1
Competing interests and sources of support	20	Both competing interests and sources of support for study reported?	0	0	0	0	1	0	1	0	0
TOTAL SCORE			10	12.5	8	10	11	12	12	15	10

Table 2: Risk of bias for RoB-2 score

RoB-2	Uckay 2017
Domain	Judged risk of bias per domain
1. risk of bias from randomisation	low
2. risk of bias from deviations from intended interventions (assignment)	low
2. risk of bias from deviations from intended interventions (adherence)	low
3. missing outcome data	low
4. risk of bias in measurement of the outcome	low
5. risk of bias in selection of reported result	low
Overall	low

Figure 1: PRISMA flow chart

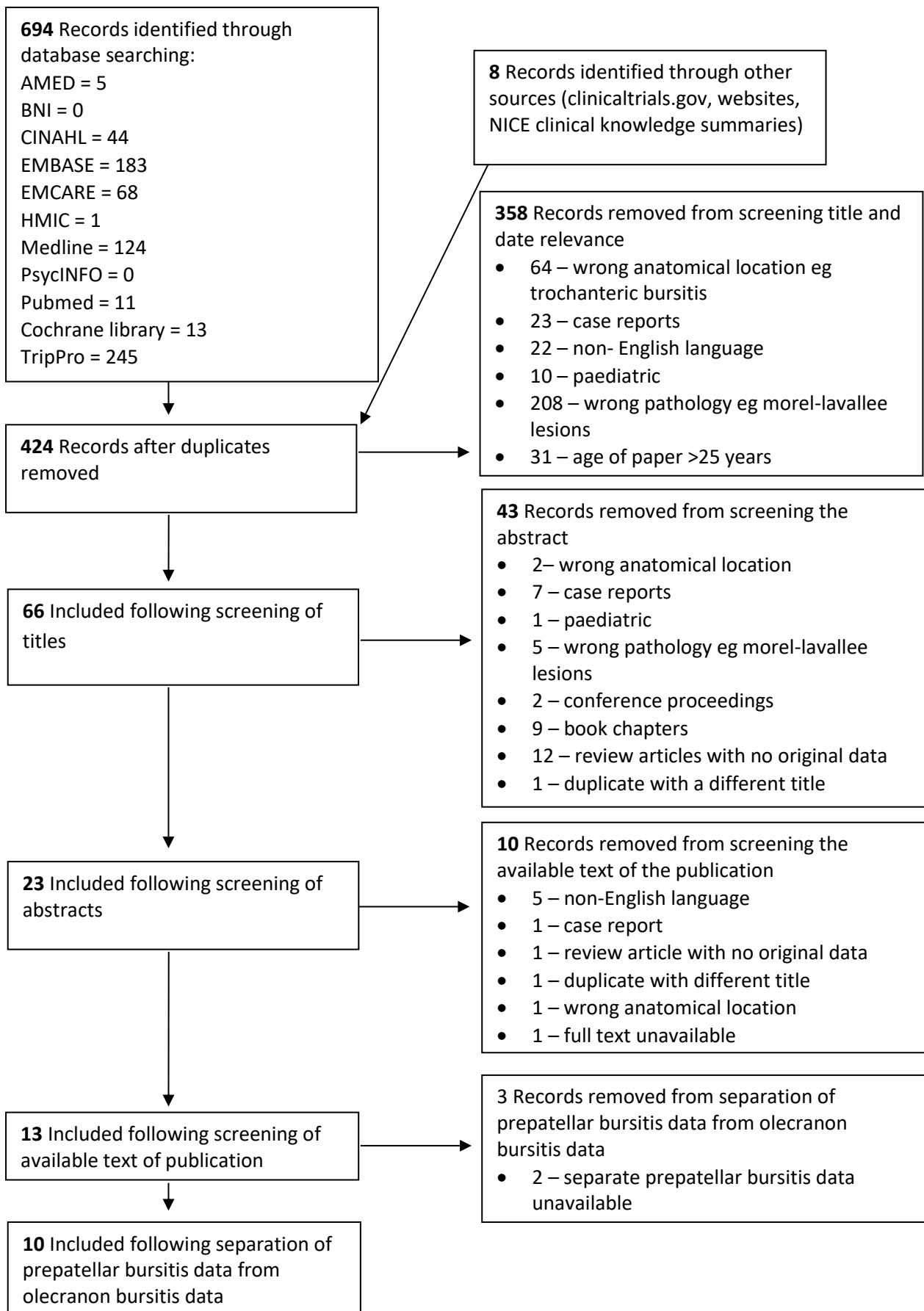


Table 3: Demographic data for all included studies

Year	1998	2000	2011	2012	2019	1999		2009			2010			2017	2017		
Author	Kaalund	Ozilvie-Harris	Huang	Dillon	Meade	Stell		Martinez-Taboada			Perez			Lieber	Uckay		
groups	endoscopic resection	endoscopic resection	endoscopic resection	endoscopic resection	endoscopic resection	septic bursitis	aseptic bursitis	cloxacillin alone	Cloxacillin and gentamicin	Cloxacillin and rifampicin	7 days or less of Abx	8-14 days of Abx	more than 14 days of Abx	septic patellar bursitis	1 stage open bursectomy	2 stage open bursectomy	
septic/aseptic	septic	aseptic	aseptic	septic	septic	septic	aseptic	septic			septic			septic	septic		
severity	recalcitrant	recalcitrant	recalcitrant	hospitalised	recalcitrant	all		hospitalised/IV abx			hospitalised			hospitalised	hospitalised		
PPB patients	4	19	60	8	13	7	7	20	22	15	17	30	44	13	13	21	
antibiotics	all given methicillin	NM	none	pre-op IV antibiotics given to all	NM	10 day course of flucloxacillin or erythromycin. 6/7 septic given flucloxacillin, one Per V. 3/7 aseptic given flucloxacillin		cloxacillin alone	cloxacillin and gentamicin	cloxacillin and rifampicin	co-amoxiclav most common IV, followed by flucloxacillin. Orals were clindamycin followed by co-amox and flucloxacillin			non op pts treated with vancomycin or oxacillin. Op Mx treated with vanc, nafcillin, or cefazolin.		total 7 days abx (IV for 1 day and PO for 6 days)	
immunocompromised	NM	1 patient RA	none	none	1 diabetic	1 diabetic pt		(total 6) 3 RA, 2 ETOH, 1 DM, 1 cancer, and 1 bronchiec tasis.	(total 4) 2 ETOH, 1 with DM, 1 with RA who was on methotrex ate	(total 4) 3 ETOH, 1 DM, 1 previous bursitis	26% (DM, HIV, post transplant, alcoholism, renal failure, active malignancy, Child-Pugh B/C)			6/13 pts diabetic, none immunosuppressed 2 patients had prior joint pathology, 5 had recent trauma		3 diabetic patients	none
average age	NM	31 (19-57)	33.5 +/- 11.1 years	36 (23-68)	46.23 (8-77)	31.4 in SB,	36.1 in NSB	46.85 (11.77)	46.64 (15.75)	40.6 (13.08)	mixed with olecranon bursitis group			55.6 (SD 19.6)		NM	
Gender	NM	NM	31M 29F	8M	12M 1F	5M 2F 5B	6M 1F 5B	13M 7F	19M 3F	14M 1F	mixed with olecranon bursitis group			11M 2F		NM	
staph aureus rate	NM	NM	NM	100% bacteria isolated. 5/8 Staph aureus	most cases caused by staph aureus'	all staph aureus	none	overall 67% positive result, with 94.4% of those staph aureus			1/3 unable to isolate bacteria. 94.4% SA in those isolated			most common organism was MSSA (9/13 PPB patients). Followed by MRSA in 1 and coagulase -ve staph in 2.		10 (2 MRSA)	13 (1 MRSA)
follow up	3 months	average 2.7y (1.1-5.5 years)	45.3 +/- 14.9 months	6 weeks	NM	2-4 days for initial f/u, long term f/u at 6 months 12m and 18m.		NM			2.7-67 months (mean 23 months)			2 months		2 months, and 1 year	

Table 2 – demographic data. Key: NM = not mentioned; Abx = antibiotics; RA = rheumatoid arthritis; ETOH = alcoholism; DM = diabetes mellitus

Table 4: Endoscopic versus open bursectomy, showing no difference in long or short term recurrence, or surgical complication rate

	Endoscopic						Open				Endoscopic vs Open	
	Kaalund 1998	Ogilvie Harris 2000	Huang 2010	Dillon 2012	Meade 2019	TOTALS	Perez 2010	Lieber 2017	Uckay 2017	TOTALS	odds ratio (OR)	significance
no of pts	4	19	60	8	13	104	47	4	34	85		
Long term recurrence	N/A	2	3	1	N/A	6/87	N/A	N/A	1	1/34	OR 0.41, 95% CI 0.05 - 3.53	p = 0.67
% long term recurrence		10.53%	5.00%	12.50%		6.90%			2.94%	2.94%		
short term recurrence	0	N/A	N/A	N/A	1	1/17	4	1	N/A	5/51	OR 1.74, 95% CI 0.19 - 16.03	p = 0.62
% short term recurrence	0%				7.69%	5.88%	8.51%	25.00%		9.80%		
surgical complications	0	3	0	1	2	6/104	N/A	1	2	3/38	OR 1.44, 95% CI 0.34 - 6.08	p = 0.44
operative time (minutes)	N/A	N/A	18 +/- 5.6	25	N/A	18.82	N/A	N/A	N/A	not recorded		
Hospital stay	N/A	N/A	N/A	6	2.23	3.67	N/A	8.3	6.42	6.80		
normal ROM at follow up	4	19	60	N/A	N/A	100.00%	N/A	N/A	32	96.97%		
Return to work at 3 weeks	all at 3m	N/A	60	8	N/A	3 weeks/ 3 months	N/A	N/A	median return to work 23 days	N/A		
No pain	N/A	14	48	8	N/A	80.46%	N/A	N/A	N/A	N/A		

Key: N/A = data not available or not reported. Long term recurrence defined as 1 year or over; short term recurrence defined as three months or less.

Table 5: Operative versus non-operative septic prepatellar bursitis

	septic										odds ratio	significance
	non-operative			operative								
	Stell 1999	Martinez-Taboada 2009	total	Kaalund 1998	Dillon 2012	Meade 2019	Perez 2010	Lieber 2013	Uckay 2017	total		
Total number	7	20	27	4	8	13	47	4	34	110		
recurrence	2	0	2	0	1	1	4	1	1	8	OR 0.99, 95% CI 0.20 - 4.95	p = 1.00
% recurrence	28.57%	0.00%	7.41%	0.00%	12.50%	7.69%	8.51%	25.00%	2.94%	7.27%		
Time recurrence measured	2-4 days for initial f/u, long term f/u at 6 months 12m and 18m.	NM		3 months	6 weeks	NM	2.7-67 months (mean 23 months)	2 months	2 months, and 1 year			
hospital stay	N/A	8.7	8.7	N/A	6	2.23	8	8.3	6.42	6.58		
range/SD		SD 9.06	SD 9.06		range 4-9 days	range 0-8 days	range 6-13 days	SD 3.8	N/A	N/A		

Key: NM = not mentioned, OR = odds ratio, with 95% confidence interval represented. f/u = follow up, SD = standard deviation

Table 6: Operative versus non-operative aseptic prepatellar bursitis

	aseptic				odds ratio	significance
	non-operative	operative				
	Stell 1999	Ogilvie-Harris 2000	Huang 2011	total		
Total number	7	19	60	79		
recurrence	2	2	3	5	OR 0.17, 95% CI 0.03-1.10	p = 0.10
% recurrence	28.57%	10.53%	5.00%	6.33%		
Time recurrence measured	2-4 days for initial f/u, long term f/u at 6 months 12m and 18m	average 2.7y (1.1-5.5 years)	45.3 +/- 14.9 months			
hospital stay	N/A	N/A	N/A	N/A		

Key: N/A = data not reported or not mentioned, OR = odds ratio, with 95% confidence interval represented. f/u = follow up, SD = standard deviation

Table 7: Duration of antibiotic treatment, comparing those treated for seven days or less with those treated for eight days or more

paper	< 8 days			8 days plus					odds ratio (OR)	significance
	Perez 2010	Martinez-Taboada 2009	total	Perez 2010	Stell 1999	Martinez-Taboada 2009	Uckay 2017	total		
total no	17	1	18	74	7	56	34	171		
recurrence	2	N/A	2/17	7	2	N/A	1	10/115	OR 0.66, 95% CI 0.13 - 3.29	p = 0.64
% recurrence	11.76%	N/A	11.76%	9.46%	28.57%	N/A	2.94%	8.70%		
Time recurrence measured	2.7-67 months (mean 23 months)	NM		2.7-67 months (mean 23 months)	2-4 days for initial f/u, long term f/u at 6 months 12m and 18m.	NM	2 months, and 1 year			
hospital length of stay	8	5	7.83	8	N/A	9.75	6.42	8.28		

Key: N/A = data not reported or not mentioned, 95% confidence interval represented. Martinez-Taboada's cohort only reported inpatient characteristics so could not report recurrence.

Appendix

Appendix 1: search terms used for database searching

Bursitis AND (prepatella* OR pre-patella* OR patella* OR (knee AND bursa*)) AND (treat* OR manage* OR aspirat* OR excis* OR therap* OR interven*)