Lateral Retinacular Release for Anterior Knee Pain

A Systematic Review of the Literature.

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Running Title: Lateral retinacular release. A systematic review

Abstract:

Background: Lateral retinacular release for anterior knee pain is a popular procedure. Despite its popularity the indications and pre-operative evaluation is not clearly defined. Goal of this paper is to perform a systematic review of the literature in order to evaluate the outcome of lateral releases for anterior knee pain. In addition we attempt to compare the results of open versus arthroscopic lateral releases.

Study design: Systematic Review of the literature.

Methods: Articles were retrieved from 5 major databases. 278 articles were evaluated based upon their abstracts. 42 studies were found to be relevant. Strict inclusionary criteria were defined and a ranked appraisal was performed.

Results: Ten studies met the inclusionary criteria. There was only one randomized clinical trial. A total of 450 patients were evaluated. Overall 76% of all patients had less pain after the surgery. 12% of patients went on to have a revision surgery. There were no statistical differences between the open and the arthroscopic treatment groups. Bleeding and infection were rare complications in both groups.

Conclusions: lateral retinacular release yields good results in 3/4 patients. Lateral patellar tightness is thought to be the most important factor. 12% of patients need revision surgery. Results are worse in patients with patellar instability. Postoperative bleeding complications are low. There is no difference between open and arthroscopic techniques.

Clinical relevance: Lateral retinacular release is frequently performed. There is no consensus in the literature or among experts concerning open versus arthroscopic lateral releases. This study is the first to perform a systematic review of the literature.

Key Terms: Lateral retinacular release, Systematic review, Patella, Knee

Introduction:

Lateral retinacular release is a commonly performed procedure. The American Board of Orthopaedic Surgery statistics for the year 2000 show that lateral release ranks 47th among all procedures performed by orthopaedic surgeons taking part two (oral) of the board examination (8).

Despite its frequency the indications, results and complications of a lateral retinacular release remain controversial. The acceptable results (good and excellent) have a wide range from 14% to 99% (1,5,14,15). Complications have been described in as many as 11% of all patients for open, or arthroscopic lateral releases (20). The indications for this procedure range from isolated treatment of anterior knee pain with or without tight lateral retinaculum, patella instability, to being an adjunct treatment after traumatic and chronic patella dislocations (9,12). Lateral retinacular release can be performed as an open, mini-open, or arthroscopic procedure. The preoperative evaluation (imaging) varies widely. In a recent survey among board certified Orthopaedic Surgeons the opinions were divided roughly 50/50 for the use of open versus arthroscopic lateral release (8).

There have been numerous studies with a wide range of study designs addressing the outcome of lateral retinacular release. The majority of these studies are case series and retrospective chart reviews (level IV evidence) that are either statistically underpowered or have short post-operative intervals.

To date there has only been one prospective randomized clinical trial (level I) published comparing open versus arthroscopic lateral retinacular release (20).

One way to increase the power of underpowered clinical studies is to conduct a meta-analysis. This can be done on Level I, II and III studies. With the majority of the available literature on lateral retinacular release for anterior knee pain being level IV evidence, a meta-analysis can not be performed due to the lack of control groups. Another way of clarifying literature from an evidence based point of view is to conduct a systematic review of the literature. This is a reproducible review that uses clearly defined criteria and appraises available studies according to a-priori defined standards. After appraisal the studies can then be recognized according to their scientific validity (11).

The primary objective of this study was to systematically review the English literature in order to determine the effect of lateral retinacular release for patients complaining of anterior knee pain. A secondary objective was to assess possible differences in the outcome between open versus arthroscopic lateral retinacular release techniques.

Material and Methods

Objective:

The objective of this study was to review all articles that evaluated the outcome of lateral retinacular release surgery, arthroscopic or open, that were performed for anterior knee pain in the absence of acute or chronic patella instability.

Study Identification:

All available clinical trials, cohort studies, case control studies and retrospective chart reviews available in five major computerized databases from 1966 through August 2005 were included:

a. **Cochrane Database register of systematic reviews:**

   key words: “knee AND lateral release NOT arthroplasty NOT congenital”

b. **PubMED clinical query-therapy review engine:**

   key words: “knee AND lateral release NOT arthroplasty NOT congenital”

c. **Medline clinical database:**

   key words: “knee AND lateral release NOT arthroplasty NOT congenital”

d. **EMBASE:**

   key words: “knee AND lateral release NOT arthroplasty NOT congenital”

e. **Ovid Medline (1966-1995 and 1995-2005 and “daily update”)**

   key words: “knee AND lateral release NOT arthroplasty NOT congenital”

Abstracts volumes of the last three annual meetings of the Arthroscopy Association of North America (AANA), American Society for Sports Medicine (AOSSM) and American Society of Orthopaedic Surgeons (AAOS) were searched in order to include any study that may not have been published to this date. We assumed that any valid clinical study addressing our objective would have been published within three years of being presented at a major meeting.

In addition to the database search we cross-referenced the citation index of relevant articles.

Once all articles were identified abstracts were reviewed and evaluated for relevance with respect to lateral retinacular release performed independent from a total knee arthroplasty or congenital malformations. All studies with relevant abstracts were obtained in hard-copy and studies were examined with respect to our a-priori defined inclusionary and exclusionary criteria.

Inclusionary / Exclusionary criteria:

The inclusionary / exclusionary criteria were defined before the articles were appraised.

Included were articles that had a minimum of 24 months follow-up for each subject, and sample size of more than 20 patients per group.

Excluded were articles that reported patients with symptoms of acute or chronic patella instability, additional procedures on the extensor apparatus other than lateral release, and articles not published in English

Appraisal:

In the literature there is no clearly defined standard as to how to appraise non-randomized clinical trials and case series. Utilizing the Cochrane database website (6) and other evidence based medicine sources (11) we designed an eight point grading system. This grading system was based upon six object criteria and two subjective criteria (Figure 1).

The objective criteria included the "*level of evidence*", "*total number of subjects*", "*percentage of patients that followed up*", "*length of follow up*", "*defined inclusion /*

exclusion criteria" and "*quality of reported results*". The quality of reported results was assessed based upon the presence of 1) *functional*, 2) *anatomic* and 3) *outcome score* data. Each one of the aforementioned results criteria was assigned one point if reported in the study.

The subjective criteria used were "*validity of conclusions drawn from the paper*" and, "*overall subjective quality assessment of the study*". Validity was assessed by outlining the conclusions of the paper and assessment as to whether the conclusions were supported by the results. If all conclusions were supported all three points were assigned, if one or more conclusions were not supported but one or more conclusions were supported by the results two points were assigned. If none of the conclusions was supported by the results one point was assigned. Subjective quality assessment was done by assigning either the value "high" or the value "low". An overall rank was assigned to the study based upon the total score. The ranking of the articles was taken into account for the discussion of the results and the overall conclusion of this review.

All articles were appraised by two independent reviewers (CL and GD) in order to decrease bias. In case of differences with respect to the appraisal of individual articles the differences were solved by means of discussion as has been previously reported (3).

Analysis:

The analysis of included papers was done according to the level of evidence. There was only one randomized clinical trial, no level II or level III studies. Hence, a meta-analysis could not be performed. The identified Level IV studies were pooled and a weighted average for the demographics and outcome parameters was performed.

Outcome parameters were defined as improvement of pain postoperatively (reported as: % of patients), incidence of excessive postoperative bleeding (reported as total number), incidence of post-operative infections (reported as total number) and number of subsequent operative procedures on the involved leg.

Statistics:

Weighted averages were obtained on all outcome parameters. The epidemiological data was reported as the mean and standard deviation. Students T-test was performed to record significant differences between groups. Significance was defined as $p \leq 0.05$.

Results:

Study Identification:

The literature search generated 278 articles. The search of the databases generated 255 studies listed in "Pubmed", 238 studies listed in "Ovid Medline (1966-1995 and 1995-2005 and "daily update")"and two studies listed in "PubMED clinical query-therapy review engine". The review of EMBASE and the Cochran data base as well as the review of the abstract books of the AANA, AOSMM and AAOS meetings from 2002 to 2005 did not generate any studies that were not identified in the database search. Cross-referencing the citation indices of relevant studies added three studies. After cross checking for duplicates we obtained a total of 278 articles whose abstracts were checked for relevance to our objective.

Forty-two studies were identified to have abstracts relevant to clinical results after lateral release and anterior knee pain. Out of these 42 studies, 15 articles were excluded

because their inclusionary criteria included patella instability. An additional 15 articles were eliminated due to insufficient postoperative follow-up. Finally, two articles were excluded due to insufficient data analysis and inability to extract three out of four of the defined outcome criteria.

Overall nine studies were included in the systematic review of the literature (Figure 2). There was one "level I" study and eight "level IV" studies. There were six studies that evaluated open or mini-open lateral releases and four studies that reported the results of arthroscopic lateral releases. The studies included in the review were published between 1982 and 2005.

Demographic Results:

A total of 450 patients were included in the review. The average age was 31 (±1) years. There were overall 43% (±22%) male patients. The average follow up was 52(±19) months. The average percentage of patients followed up out of the original treated group was 92%(±2).

There were a total of 145 patients who underwent arthroscopic lateral release as compared to 305 that underwent open release. Patients in the arthroscopic group were slightly younger (mean: 27 yrs ± 3 yrs) as opposed to the open release group (mean: 32 yrs ± 7yrs). The average follow up in the arthroscopic group was 56 (±27) months compared to 50(±12) months in the open release group. The percentage of male patients was higher in the open group with 50% (±28%) as compared to 34% (±9%) in the

arthroscopic group. The average percentage of patients followed up out of the original treated group was 91%(±1) for the arthroscopic group and 93%(±1) for the open group. These differences were not significant (f/u: $p \leq 0.6$; age: $p \leq 0.3$; %male: $p \leq 0.3$)(Figure 3).

Outcome parameters (Figure 4):

Pain:

Overall 76% (±16) of all treated patients reported less pain after the procedure. There was no statistical difference between the two groups ($p \leq 0.998$) but the weighted average for each group individually showed 79%(±7) patients with less pain in the arthroscopic versus 70%(±19) in the open release group.

Revision Surgery:

Overall, there were 50/420 (12%) patients that required revision surgeries within the follow up time frame. There were 11/145 (8%) patients that needed revisions surgeries in the arthroscopic group and 39/305 (13%) in the open group.

Postoperative Bleeding:

One study that was included did not include information on postoperative complications (19). The overall incidence of postoperative bleeding (hemarthrosis, that

needed to be aspirated) was 9/420 (2%) with 3/145 (2%) reported for the arthroscopic technique and 6/305 (2 %) reported for the open technique.

Postoperative infections:

The overall number of infections was low with only 4/420 (0.9%) cases reported for both groups. Three cases, including two superficial infections, were reported in the arthroscopic group. One case was reported for the open release group.

Appraisal results:

Nine studies were selected for the appraisal, three studies addressing arthroscopic lateral release only (1,2,18) and five studies addressing open lateral release only (7,13,17,19,21). One study compared the two techniques in a randomized clinical trial (RCT) (16). The data of this study was independently evaluated for each arm. Thus a total of ten studies was assessed.

There were two Level I studies and eight level IV studies. Four out of nine studies were rated as having well defined inclusion and exclusion criteria.

One study included the minimum of 20 patients. Eight out of ten studies included between 20 and 50 patients and one study included more than 50 patients.

Five out of ten studies had a follow-up percentage of more than 90%. Three out of ten studies had a follow-up percentage of 80 to 90%. Two studies had less than 80% follow-up.

Two studies showed more than five years follow up. Eight out of ten studies showed follow-up times between two and five years. All studies had a longer follow-up than two years.

Two out of ten studies had well defined inclusionary criteria. Two studies had not well defined inclusionary criteria and six out of ten studies had no defined inclusionary criteria.

All studies reported their results utilizing functional scores or knee documentation forms that were discoverable. Four out of ten studies reported their results including subjective and objective data with respect to function, anatomy and subjective outcome and were assigned three points. Six out of ten studies omitted reports about either functional, subjective or objective outcome measures and were therefore awarded two points. All studies reported at least two of the three criteria.

The evaluation for validity of conclusions and overall impression of the study yielded six out of ten studies were ranked high and were awarded three points. Two studies were ranked medium and were awarded two points. Two studies ranked low and were awarded only one point.

The overall subjective rating yielded five out of ten studies that were overall ranked as high and five out of ten that were ranked low.

The overall appraisal results of the studies are reported in figure 5a and 5b.

Discussion:

A recent study reported that isolated lateral retinacular release is one of the more common procedures among young surgeons taking the oral boards (8). This appears to be in contrast to the low frequency of isolated lateral retinacular release procedures (<1%) performed by experts in the field (members of the International Patellofemoral Study Group) (8).

The objective of this systematic review, therefore, was to evaluate published studies addressing the outcome after isolated lateral release of the patellar retinaculum performed as the treatment for anterior knee pain. The purpose was to identify the current status of the available literature and recommendations that can be drawn from it.

There have been various reports of deterioration of results after two years. Thus, only studies with follow-up times longer than two years were included. This eliminated 15 studies from the review. A further 15 studies had to be excluded because they were addressing patients with documented instability of the patella.

The appraisal of the selected studies was performed according to the criteria displayed in Figure 1. There are well defined guidelines for the appraisal of RCT's and also cohort and case control studies. However, there is controversy and no clearly defined guidelines as to which scale or system to use for the appraisal of case series in orthopaedics. We therefore utilized six objective criteria and two subjective criteria to evaluate the nine studies. This evaluation clearly favored the one randomized clinical trial and studies with high patient enrollment and follow-up percentage. This was intentional

and was designed to reduce bias. It is difficult to translate the appraisal rank into a measure of validity for the objective of this review. We decided to draw our clinical recommendations from the four top ranked papers. In addition we chose to point out certain pertinent findings taken from other studies that may not have been part of the set of appraised studies.

The only prospective randomized clinical trial published on the outcome of lateral release in anterior knee pain is the study performed by O'Neil in 1997 (16). He compared open versus arthroscopic lateral release in 86 patients with anterior knee pain and a tight lateral retinaculum as documented with a positive lateral tilt test. All these patients had undergone extensive physical rehab prior to surgery. O'Neil provides us with strong evidence that a well defined patient population that has isolated anterior knee pain with documented lateral retinacular tightness without a history of patellar dislocation or subluxation can successfully be treated with open or arthroscopic lateral release. His study showed that the overall outcome of these procedures is very good with over 90% of patients in either group reporting return to their respective athletic activities. This study also showed that there was a trend towards better Lysholm scores when open lateral release was performed, this was, however, not significant. In terms of complications and subsequent surgical procedures there was no difference between the two groups. O'Neill's study corresponds very well with the overall results of our systematic review. Generally there does not seem to be a difference in postoperative complications such as bleeding or infections between the open and arthroscopic lateral release. In terms of the overall reduction of pain O'Neill reports the best results of all appraised studies reporting between 93% and 100% of patients in both groups having excellent results.

When comparing O'Neill's data with the appraised level IV studies it becomes obvious that regardless of the different study design the overall age of the patients, sex distribution, surgical technique as well as preoperative duration of symptoms is not significantly different. The most significant difference in his patient population is the strict inclusionary criteria of his study. We believe that the strict application of the diagnostic criteria that O'Neill used for his study population is a key feature to his successful results. As Fulkerson and Kolovitch have previously described, isolated lateral release of the patellar retinaculum is most likely to yield good results if done for a tight retinaculum in the absence of patella dislocation, subluxation or severe retropatellar arthritis (9,14).

These findings are supported by the results that Panni reported in his study. He reported about 50 patients that had been identified by clinical exam displaying a tight lateral retinaculum as well as a normal Merchant-view and negative dynamic CT scan as described by Fulkerson (18). He retrospectively compared this group with a group of 50 patients that had clearly abnormal CT-scans and findings of patellar instability. His results indicated that there were a significantly lower overall satisfaction, lower pain and Lysholm II scores in the group with findings of patellar instability. Panni reported 70% good and excellent results in his anterior knee pain patients. This number, however, is lower than the results reported by O'Neill (16).

Dzioba also supports the importance of lateral tightness and contributed that all patients who had a documented hypertrophy of the lateral retinaculum as shown by an intra-operative biopsy displayed a decreased lateral patellar tilt. These patients did very well after four years with 82% good and excellent results and 95% improved pain

characteristics. He pointed out that the patients doing poorly were individuals that did not have a positive Merchant view or a tight retinaculum (7).

Shea and Fulkerson also reported 90% good and excellent results as long as the pre-operative examination revealed a tight lateral retinaculum in the absence of medial facet wear. They recommended extensive patello-femoral rehabilitation and a dynamic CT scan prior to surgery in order to rule out significant patellar instability that may require extensor mechanism alignment surgery rather than a release of the lateral retinaculum (19).

Gecha tried to identify prognostic factors for the efficacy of lateral release surgery in the treatment of patello-femoral pain (10). This study was excluded due to the relatively short follow up time but addresses this very important question in a prospective fashion. He also concluded that the sole best prognostic indicator is the absence of signs of patellar instability. He did not identify the tight lateral retinaculum as directly associated with a good outcome.

The overall complication rate was low in all studies. Surprisingly even post-operative bleeding was not a significant issue. This may have to do with the fact that none of the authors used a postoperative suction drain and a thorough hemostasis was obtained during arthroscopic and open surgery. Small reported on the overall complication rate of 7.2% in 446 patients collected from 21 arthroscopic surgeons. He reported a higher complication rate with the use of a tourniquet (20). His overall complication rate corresponds well with the finding of our systematic review.

Most authors agree that findings of significant lateral facet changes (grade 3 or 4 Outerbridge) coincide with worse results. Although Aderinto noted that 80% of patients have less pain but only 42% are satisfied with the results of the procedure (1).

A subject of debate had been the possible denervation and loss of vastus lateralis function after a lateral retinacular release. Vaatainen addressed this issue by recording EMG's for the vastus lateralis muscle before and after lateral release. He noted no significant differences in muscle strength or recruitment after the lateral release (21).

There is only one study addressing the outcome of Workman's Compensation (WC) patients versus non-compensation patients (4). This study reports slightly worse results in the WC patients (50% good and excellent versus 58% good and excellent). The overall results of this study, however, do not correspond with the overall findings of the appraised studies. This may have to do with the fact that the inclusionary criteria for this retrospective study were ill defined. Generally patients with anterior knee pain that failed rehabilitation were included. There were no physical exam findings or radiographic criteria utilized for the selection of these patients.

One element of concern is the effect on the Q angle in patients who have a tight lateral retinaculum. It is unclear what happens in patients with an increased Q-angle if the lateral retinaculum is released. Potentially the Q-angle could be increased and subsequently may lead to instability. There is no literature that addresses this problem.

As a final remark it has to be pointed out that there is no standard with respect to the extent of the lateral patellar release. Most authors seem to agree that the release is sufficient when the lateral patellar tilt is 90° as described by Aglietti (2). However there is no objective data to support this finding.

Conclusion:

The systematic review of the available literature on the outcome of lateral retinacular release showed a paucity of strong evidence based studies. There is only one RCT. Various studies have been advertised as prospective studies. When scrutinized, however, none of these studies appeared to be truly prospective. There remains a strong need for randomized clinical trials to assess the efficacy and outcome of lateral retinacular release in the treatment of anterior knee pain.

The available literature stresses the need to document lateral retinacular tightness and the absence of signs of patellar instability prior to isolated lateral release surgery. Any history of patellar dislocation or subluxation should raise a “red flag” as a warning for possible failure of an isolated lateral release.

If done in the appropriate patient population an isolated lateral retinacular release has a good chance for success. The overall number of patients that qualify for this procedure, however, is low. Less than 15% of all patients that are being seen in the office for anterior knee pain require surgical treatment. There is no data on the number of patients that do require surgical treatment but have signs of instability. Clinical and OR records of the senior author of this study (BRB) indicate that 34 isolated lateral releases were performed for lateral retinacular tightness over the course of 19 years and 4800

operative procedures on the knee. The overall number of lateral releases is therefore less than 1%. This coincides well with the number of isolated lateral releases performed by members of the International Patellofemoral Study Group who also report less than 1% of their annual cases. These numbers should caution surgeons, not to over- utilize this procedure.

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Figure 1:

Appraisal Criteria

Objective:	**points:**	**Criteria:**
1. Level of Evidence:	1 – 4	LOE as defined in JBJS
2. Total Number of Subjects:	1 – 3	20; 20 – 50; > 50
3. Percentage f/u:	1 – 3	> 80%; 80 – 90%; >90%
4. Length of f/u:	1 – 3	2yrs; 2-5yrs; >5 yrs
5. Definite Inclusion / exclusion criteria:	1 – 3	undefined; non precise; precise
6. Quality of reported results:	1 – 3	Functional (one point each) Anatomic Outcome score
Subjective:		
1. Validity of conclusions:	1 – 3	not valid; undefined; valid
2. Overall subjective quality assessment:	1 – 2	high; low

Figure 2

Literature Search Results

Data Bases:

Pubmed:	255
Pubmed clinical query-therapy review:	2
Ovid Medline: (1966-1995, 1995-2005, "daily updates)	238
EMBASE / COCHRANE:	only duplicate studies found

Other Sources:

Abstract books: AANA, AOSSM, AAOS	0
Experts in the field:	0

Total number reviewed: 278

Total number relevant to topic: 42

Total Number meeting incl. / excl. criteria: 9

Figure3:

Demographic Information

	total	**A'scopic(#)**	**Open(#)**
Total Number of patients:	450	145	305
Average age(years):	31 (±1) years	27 (±3)	32 (±7)
% male patients (%):	43 (± 22)	34 (± 9)	50 (± 28)
Average f / u (months):	52 (± 19)	56 (± 27)	50 (± 12)
Percentage f / u (%):	92 (± 2)	91 (± 1)	93 (± 1)

no sign. difference between both groups

Figure 4

Outcome Data

	total	**A'scopic(#)**	**Open(#)**
Pain improved (%):	76 (± 16)	79 (± 7)	70 (± 19)
Revision surgeries (N / %)):	50 (12%)	11 (8%)	39 (13%)
Bleeding (N / %):	9 (2%)	3 (2%)	6 (2%)
Infections (N / %):	4 (<1%)	3 (2%)#	1 (<1%)

no sign. difference between both groups

Figure 5a

Appraisal Results

Arthrosc.	**LOE**	**# subj**	**% f/u**	**f/u**	**i/e criteria**	**quality**	**validity**	**overall**	**rank**
Panni '05	1	2	2	3	2	3	3	2	**2**
Aderinto'02	1	2	2	2	2	3	2	1	**4**
O'Neill '97#	4	2	3	2	3	3	3	2	**1**
Aglietti'89	1	1	3	2	1	2	2	1	**7**
Open:									
O'Neill '97#	4	2	3	2	3	3	3	2	**1**
Vaatainen'94	1	2	1	2	1	2	3	1	**8**
Shea '92	1	2	3	2	1	2	3	2	**3**
Jackson'91	1	2	2	3	1	2	1	1	**9**
Dzioba '90	1	2	1	2	1	2	3	2	**5**
Osborne"82	1	3	3	2	1	2	1	1	**6**

RCT with Artroscopic and open group

Figure 5b

Appraisal Results

Level of evidence:	# of studies:
I	2/10
II	0/10
III	0/10
IV	8/10

I/E criteria:	# of studies:
Well defined	2/10
Not well defined	2/10
Undefined:	6/10

Number of Patients:	
20	1/10
21-50	8/10
> 50	1/10

Quality of outcome parameters:	
high	4/10
medium	6/10
low	0/10

Percentage of follow-up	
>90%	5/10
80-90%	3/10
< 80%	2/10

Validity of conclusions:	
high	6/10
medium	2/10
low	2/10

Length of follow-up	
> 5yrs	2/10
2-5 yrs	8/10
2 yrs	0/10

Overall subjective rating:	
high	5/10
low	5/10