

National consensus on the definition, investigation, and classification of meniscal lesions of the knee



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ABSTRACT

Background: The aim of this study was to deliver standardised terminology for the identification and stratification of patients with meniscal lesions of the knee.

Methods: A national group of expert surgeons was convened by the British Association for Surgery of the Knee (BASK) and a formal consensus process was undertaken following a validated methodology. A combination of nominal group techniques and an iterative Delphi process was used to develop and refine relevant definitions. Where appropriate, definitions were placed into categories to facilitate use in clinical practice and guideline development.

Results: A degenerative meniscus develops progressively with degradation of meniscal tissue and this may be revealed by intra-meniscal high signal on magnetic resonance imaging (MRI). A meniscal tear was defined as a defect or split in the meniscocapsular complex, which can occur in a degenerative or non-degenerative meniscus. Degenerative meniscal lesions (high signal or tear) are frequent in the general population and are often incidental findings on knee MRI. Symptoms were defined and classified into three groups: (1) strongly suggestive of a treatable meniscal lesion, (2) potentially suggestive of a treatable meniscal lesion, (3) osteoarthritic. A strategy for radiological imaging (radiograph ± MRI) was agreed for the investigation of the patients with a possible meniscal tear. Meniscal lesions and tear patterns on MRI imaging were defined and classified with reference to potential treatability: (1) target, (2) possible target, (3) no target.

Conclusions: The agreed terminology will enable patients with meniscal lesions to be identified and stratified consistently in clinical practice, research and guideline development.

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1. Introduction

Patients with meniscal pathology are a heterogeneous population with a widely variable pattern of symptoms and radiological features [1]. More than one third of people over the age of 50 without any radiographic evidence of osteoarthritis have meniscal pathology detectable on magnetic resonance imaging (MRI), rising to over 70% for individuals with osteoarthritis [2]. Many meniscal lesions are asymptomatic and pain and other symptoms in the knee can often be attributed to other pathology, especially osteoarthritis [2–5].

When a meniscal ‘tear’ is considered the cause of symptoms, surgical treatment to excise the unstable meniscal tissue is frequently recommended and this procedure, arthroscopic partial meniscectomy (APM), has become the most commonly performed orthopaedic procedure worldwide [6,7]. Recently, following the publication of several randomised controlled clinical trials, there has been debate about the effectiveness of this procedure [8–13]. Interpretation of the evidence has, however, been hampered by inconsistent and broad inclusion criteria, with specialists arguing that the patients selected would not be considered eligible for surgery in contemporary practice [10,14,15].

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¹ See the Appendix A section.

The pattern of symptoms is thought to be critical to the identification of patients with a meniscal origin for their knee pain, with the importance of corresponding ‘mechanical’ symptoms being particularly frequently highlighted [10,12,16–20]. Despite this, no definition for these symptoms has been agreed [14]. Furthermore, given that many meniscal tears are asymptomatic, the importance of the anatomical pattern of meniscal tear and the presence or absence of radiographic osteoarthritis has also been highlighted [21,22]. Certain patterns of meniscal tear are thought to be more likely to cause symptoms due to their mechanical ‘instability’ and some attempts have previously been made to classify the radiological appearances of such meniscal lesions [21,23,24]. There is a clear need for consensus on these terms and definitions for all the selection factors that are considered important in identifying candidates for surgical or non-surgical treatment of patients with knee pain and meniscal pathology [12].

The aim of this project was to deliver the required standardised terminology by expert consensus, to facilitate consistent identification, description, and comparison of patients with meniscal pathology in clinical practice and research.

2. Methods

A combination of validated nominal group techniques and the Delphi process was applied, in accordance with the development of consensus statements published by other groups [25–29]. An overview of the process is summarised in Figure 1. In

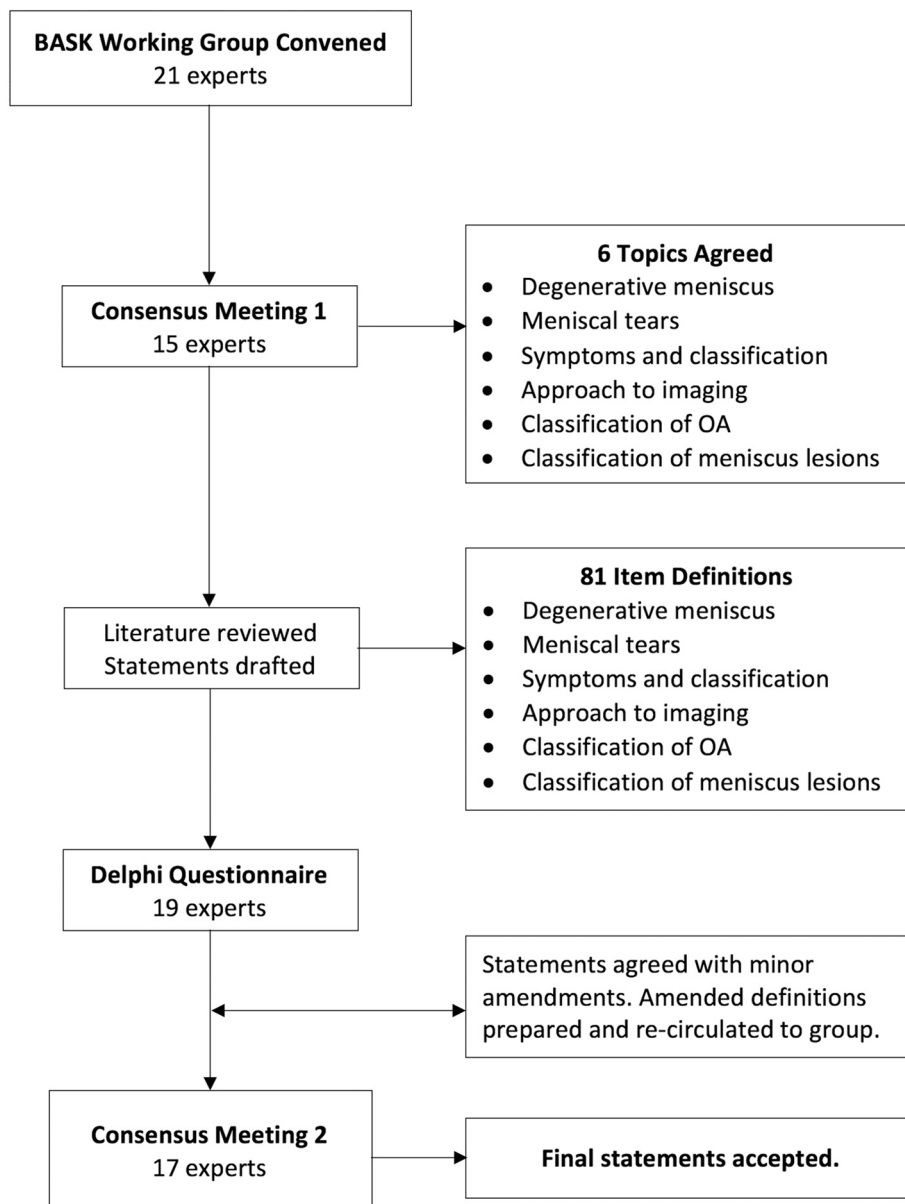


Figure 1. The consensus process.

November 2016, twenty-five expert surgeons were approached by the committee of the British Association for Surgery of the Knee (BASK) to form a working group to address uncertainty in the appropriate management of patients with meniscal pathology of the knee. In addition to a steering committee (SGFA, DJB, AJP; [Appendix A](#)), twenty-one surgeons agreed to participate and fifteen were available and attended the first scoping meeting of the group in February 2017 ([Figure 1](#)). The meeting was chaired by an independent senior academic and physiotherapist (DJB).

Prior to the meeting, a literature review was performed by the steering committee to identify previous guideline documents on the topic of meniscus lesions. Previous clinical trials were identified using a comprehensive search strategy as part of an ongoing systematic review (PROSPERO CRD42017056844). All literature was circulated electronically to the group and new publications and other relevant documents identified by any member of the group were circulated regularly to all members during the consensus process. At the first meeting, following an introduction to the process and introductions from participants, a presentation was given summarising the currently published evidence, followed by discussions to agree the topics to be covered and planned scope of the process. When available, existing definitions identified from the literature review were presented as a starting point for discussions. Throughout the process, each member of the group was encouraged to contribute any further topics for discussion.

All relevant definitions were refined by discussion and the level of group agreement was assessed by voting. Each proposed modification to a definition was put to a vote and the level of agreement was recorded. A pre-defined and accepted agreement threshold of 80% (12/15) or more of the group was required before progressing to a new topic [26].

Following this first meeting, the minutes were used to prepare a modified list of topics and proposed definitions for all the patient selection factors highlighted as important by the group. An electronic survey was then prepared inviting anonymous voting and comments on each proposed topic using proprietary software (SurveyMonkey Inc., San Mateo, California USA). Two types of questions were used: 'Likert-type', assessing level of agreement, and 'categorisation' type questions. The level of agreement was measured on a scale from 1 (disagree) to 10 (agree) [26]. A box for comments was always available and when a participant voted seven or less, the participant was asked "What is the minimum change in wording for you to agree strongly?" [26]. Consensus agreement was defined, in accordance with other published work, as a predetermined mean score of seven or greater (with fewer than 20% outliers, defined as a score of four or less) [28,29].

Where considered clinically important by the group, definitions were further placed into categories to facilitate their usage in clinical practice and guideline development. For example, in classifying symptoms and signs, it was felt to be important to distinguish those likely to be 'meniscal' in origin, from those more likely to be associated with osteoarthritis. In these cases, respondents were asked to place statements into one of two or three proposed categories or a "not applicable (remove)" category. A threshold agreement of greater than 50% was required (10 votes) to agree the placement of a definition into a category.

The questionnaire was circulated to all members of the group for voting throughout May 2017 with a response rate of 90% (19/21). A revised list of proposed topics, definitions, and categories was prepared by the steering committee and circulated to the group for further feedback in July 2017. At this stage, each individual member was asked to highlight any area of strong disagreement that would have triggered another round of voting, but this was not required. Finally, the group met again in November 2017 (17 attendees) to agree the definitive output.

3. Results

Following conclusion of the three phases of the process, analysis of the results confirmed agreement on 47/47 definitions. Of these, thirty-four definitions were in topics the group decided should be further classified to aid clinical practice and guideline development. Thirty-two (/34) of these items were classified successfully in the first round of voting using the pre-determined threshold for agreement. The two items that were not categorised and all minor amendments to wording and other comments were reviewed and considered by the steering committee. All items including amended definitions were circulated to the group for further discussion and finally approved at the meeting in November 2017.

The definitions of a degenerative meniscus and meniscal 'tears' were agreed as shown in [Table 1](#). [Table 2](#) summarises the agreed definitions of symptoms and signs and their categorisation. Four symptoms and signs were categorised as 'strongly suggestive' of a treatable meniscal lesion, highly likely to be meniscal in origin. Eight symptoms and signs were defined and categorised as being potentially suggestive of a treatable meniscal lesion, possibly meniscal in origin. Finally, based upon the ACR diagnostic criteria for osteoarthritis, five findings were defined and categorised as osteoarthritic, highly unlikely to be meniscal in origin [30].

A general approach to radiological imaging was discussed and agreed. This approach to imaging is summarised in [Table 3](#) with plain radiography being recommended as first line in patients when osteoarthritis is suspected and MRI being recommended in all

Table 1

Consensus statements: degenerative meniscus and meniscal tears.

Degenerative meniscus and meniscal tears
A degenerative meniscus develops progressively with degradation of meniscal tissue and this may be revealed by intra-meniscal high signal on MRI imaging. A meniscal 'tear' is a defect or split in the meniscocapsular complex, which can occur in a degenerative or non-degenerative meniscus. Degenerative meniscal lesions (high signal or tear) are frequent in the general population and are often incidental findings on knee MRI. There may or may not be a memorable history of knee injury.

Table 2

Consensus statements: symptoms and signs of meniscal lesions.

Strongly suggestive of a treatable meniscal lesion

Locked knee: sudden onset, complete mechanical block to flexion or extension of the knee, detected on clinical examination and which does not resolve despite adequate analgesia.

Locking: an intermittent block to normal range of movement of the knee (commonly a block to extension) with an associated unlocking movement. Knee returns to near normal after unlocking.

Catching: the sensation of something intermittently out of place in the knee and interfering with joint movement.

Tender, palpable meniscal tissue: the finding on clinical examination of a discrete, tender lump, close to the joint line.

Potentially suggestive of a treatable meniscal lesion

Episodic sharp knee pain: sharp, intermittent knee pain, occurring with sudden onset.

Intermittent knee swelling: symptom of periodic swelling of the knee, lasting for hours to days, that has occurred over a period of weeks or months.

Knee effusion: a clinically detectable intra-articular fluid collection of the knee joint.

Activity avoidance: the active avoidance of specific, potentially provoking, movements or activity e.g. twisting.

Squatting pain: knee pain that is exacerbated by deep flexion when weight bearing (may be reported by the patient or elicited during clinical examination).

Clicking ± pain:

Clicking: a clicking noise or sensation when moving the knee.

Painful clicking: a clicking noise or sensation when moving the knee that is associated with pain.

Meniscal provocation tests:

McMurray's meniscal provocation test: Positive when a click, or familiar pain, can be reproduced, heard, and/or felt on joint line palpation, when the knee is bent beyond 90° flexion and the tibia is rotated on the femur into full internal rotation then full external rotation (to test the lateral and medial meniscus respectively).

Thessaly meniscal provocation test: Examiner supports the patient by holding the patient's outstretched hands while he/she stands flatfooted on the floor. The patient then rotates his or her knee and body, internally and externally, three times, keeping the knee in slight flexion (20°). Positive when the patient experiences medial or lateral joint line pain.

Apley's meniscal provocation test: Patient lies prone and the knee flexed to 90°. The tibia is then compressed onto the knee joint while being externally rotated. If this manoeuvre produces pain, this constitutes a positive test.

Joint line point tenderness: point tenderness on the joint line, detected on clinical examination.

Posteromedial joint line tenderness: tenderness on deep palpation of the joint line, from mid medial collateral ligament posteriorly, corresponding to the location of the commonest posteromedial degenerative meniscal lesion.

Osteoarthritic symptoms and signs

Inactivity pain and stiffness: the temporary, subjective sensation of stiffness on initiation of movement, often with pain, after periods of immobility (e.g. sleeping, prolonged sitting).

Crepitus: crunching, grating or creaking detected clinically on active movement of the knee.

Bony enlargement: abnormal shape of the normal knee bony contour visible on inspection or detected on clinical examination.

Bony tenderness: tenderness on clinical palpation of the bone adjacent to the joint.

Aching pain: constant knee pain during and after activity.

other patients with suspected treatable meniscal pathology. The severity of structural osteoarthritis was defined and classified based on either plain radiographs or MRI imaging as summarised in Table 4. Three categories were accepted: (1) early or no structural osteoarthritis, (2) mild to moderate structural osteoarthritis, and (3) advanced structural osteoarthritis.

Finally, meniscal findings on MRI imaging were defined and classified as shown in Table 5. The group defined 'bucket-handle' meniscal tears and agreed these represent a clear treatment target along with displaced meniscal tears (definitively unstable) and cases of meniscal root failure. All patterns of undisplaced meniscal tears were defined by the group and then categorised as representing possible targets for meniscal surgery. It was highlighted, however, that surgeons must exercise caution when interpreting a report of findings from a static knee MRI, given that dynamic movements of the knee may cause tear displacement. Finally, MRI appearances of meniscal contour abnormality, isolated meniscal extrusion, or cases where MRI demonstrated no tear were defined and categorised in a 'no target' category.

Table 3

Consensus statements: approach to imaging for patients with a suspected meniscal lesion.

Approach to imaging

The following secondary care imaging was agreed:

1. Plain radiographs (weight-bearing AP and lateral ± Rosenberg ± skyline view) are the first line investigation when OA is suspected.
2. In patients where OA is not suspected, MRI is the first line investigation^a.
3. If plain radiographs do not demonstrate advanced osteoarthritis (K-L 4) and meniscal symptoms predominate, then MRI imaging is indicated.

^a In certain cases, when clinical findings are conclusive (e.g. locked knee), clinicians may apply their own judgement on the need for MRI imaging.

Table 4

Consensus statements: classifying the severity of structural osteoarthritis.

Classification of structural osteoarthritis
Early or no structural OA: Kellgren–Lawrence Grade 0 or 1 on plain radiographs and/or normal MRI, or MRI with possible chondral signal change and no chondral loss.
Mild to moderate structural OA: Kellgren–Lawrence Grade 2 or 3 on plain radiographs and/or partial thickness chondral loss on MRI.
Advanced to end-stage structural OA: Kellgren–Lawrence Grade 4 on plain radiographs and/or significant areas of full thickness chondral loss on MRI ^a .

^a Excluding cases of contained full thickness cartilage/osteochondral defects.

4. Discussion

This paper summarises national consensus on the definition and classification of meniscal lesions based on symptoms, signs, and radiological imaging. This is the first time that key terminology used in the management of meniscal pathology has been defined by consensus and represents a critical step in the standardisation of patient selection in clinical practice and research.

Meniscal treatment guidelines have previously been issued by surgical expert groups including the American Orthopaedic Society for Sports Medicine (AOSSM) and Arthroscopy Association of North America (AANA) [16], the European Society of Sports Traumatology, Knee Surgery and Arthroscopy (ESSKA) [31], and International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine (ISAKOS) [14]. These statements were previously limited by a lack of agreement on the terminology applicable to their target population. We hope that by delivering this terminology our work will simplify and enhance future guideline development.

The importance of this national expert consensus regarding the important patient selection factors cannot be overstated. As highlighted by our consensus group and other groups in the literature, knee pain may be caused by osteoarthritis, and meniscal tears may be incidental findings [2]. Previous clinical trials have applied broad inclusion criteria, selecting patients with any “knee pain” and a meniscal “tear” [22]. One group recently issued guidance for the management of all patients “with or without meniscal tears”, “mechanical symptoms”, or “mild to severe osteoarthritis” as a single population [32]. Generalising such a heterogeneous population in this way is potentially harmful to a large number of patients for which no high-quality evidence exists [15].

4.1. Strengths and limitations

The findings in this paper were delivered in accordance with accepted consensus methodology [25–27]. There are, however, a number of potential limitations. We cannot prove that the output from the group covers everything, and further research may highlight other important selection factors. The aim of a rigorously performed consensus process is to deliver the best possible output from the evidence available at the time, but this cannot guarantee that the output is ‘correct’ [33,34]. A period of validation is required followed by modification if indicated to be required by new evidence.

Table 5

Consensus statements: meniscal findings on MRI.

Classification of meniscal lesions
Target (treatable lesion: meniscal surgery may be indicated based on appearance)
“Bucket-handle” tear: a longitudinal tear or peripheral separation involving MORE than 25% of meniscus length (either displaced or undisplaced).
Displaced meniscal tear: a meniscal lesion with meniscal fragments displaced from their usual anatomical position.
Meniscal root failure: a complete tear or avulsion of the meniscal root.
Possible target (indeterminate lesion: meniscal surgery may be indicated based on appearance)
Undisplaced meniscal tears:
Radial tears:
Radial flap tear: a vertical and oblique meniscal tear lesion (parrot beak type).
Complete radial split tear: a radial meniscal tear lesion that extends to the meniscocapsular junction.
Partial radial split tear: a radial tear that does not extend to meniscocapsular junction.
Horizontal tear ± cyst:
Horizontal cleavage tear and meniscal cyst: a horizontal meniscal cleavage lesion that is associated with a meniscal cyst.
Horizontal cleavage tear in isolation: meniscal horizontal cleavage lesion without an associated cyst
Complex meniscal lesion: a meniscal lesion with more than one plane of tear in continuity.
Short longitudinal tear: a longitudinal meniscal tear lesion involving LESS than 25% of the overall meniscus length.
No target (unlikely treatable: meniscal surgery not indicated based on appearance)
Contour abnormality: a meniscus with an abnormal edge contour and very minor tear only.
Isolated meniscal extrusion: extension of the meniscus beyond the tibial margins without any associated meniscal tear.
No tear.

Panel composition is critically important to ensure the output from a consensus group is of value and valid [26]. The purpose of this study was to deliver definitions for the important clinical and radiological features that stratify patient presentations in clinical practice, for use in patient selection and guideline development. An expert group of surgeons with a specialist interest in this topic was considered the optimal group composition for this purpose. This decision is supported by the high level of agreement achieved within the group but it must also be acknowledged that other specialists (e.g. physiotherapists, rheumatologists) may have identified other items, modified the definitions, or ranked the included items differently for use in their own area of practice.

4.2. Conclusion

This paper summarises standardised terminology for the clinical and radiological factors that are important in the stratification of patients with meniscal pathology in the knee, as agreed using validated consensus methodology. These definitions will enable more consistent clinical practice and improve the design and interpretation of future research aimed at addressing the remaining uncertainty surrounding the treatment of this heterogeneous population of patients.

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Conflict of interest

SGFA: No conflict of interest to declare.

DJB: No conflict of interest to declare.

AJP: No conflict of interest to declare.

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Appendix A. BASK Meniscal Working Group

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C. Esler	University Hospitals of Leicester
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N. J. London	Harrogate and District NHS Foundation Trust
S. Anand	Leeds Teaching Hospitals
S. O'Leary	Royal Berkshire NHS Foundation Trust
S. M. McDonnell	Cambridge University Hospitals NHS Foundation Trust
S. R. Bollen	Spire Hospital Leeds
A. Hui	South Tees Hospitals NHS Foundation Trust
T. Spalding	University Hospitals Coventry and Warwickshire NHS Trust
W. Jackson	Nuffield Orthopaedic Centre

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