Current practice in the management of anterior cruciate ligament injuries in the United Kingdom

B Kapoor, D J Clement, A Kirkley, N Maffulli

Objective: To outline the current practice in the management of anterior cruciate ligament (ACL) injuries in the United Kingdom.

Methods: A postal questionnaire designed to include various clinical scenarios was sent out to the 321 orthopaedic surgeons in the United Kingdom who, being affiliated to one of the specialist societies of the British Orthopaedic Association, namely the British Association for Surgery of the Knee (BASK) or the British Orthopaedic Sports Trauma Association (BOSTA), have a manifested interest in treating such injuries.

Results: The response rate was 60% (192/321). Most surgeons diagnose and operate on less than 50 ACL injuries a year. The following results were obtained: 58% (76/132) used bone-patellar tendon-bone autografts, whereas 33% (44/132) used semitendinosus/graecilis autografts; 84% (108/129) would not incorporate the ACL remnant in the reconstruction; 14% (19/135) would perform an ACL reconstruction in an 8 year child with an acute rupture; 30% (42/141) would perform an ACL reconstruction in a 14 year old with an acute ACL rupture.

Conclusions: There is wide variation in the management of acute and chronic ACL injuries among orthopaedic surgeons in the British Isles. Future research and randomised controlled trials should address the issues that this investigation has raised.

Anterior cruciate ligament (ACL) injuries are common sports injuries and one of the most commonly treated conditions of the knee in the young.1 Sports such as soccer and skiing account for most of these injuries in the United Kingdom. Although ACL injuries are common, there is still considerable variation in their management. If left untreated, this may lead to functional instability, secondary osteoarthritis, and increased risk of meniscal injuries.2,3 There is controversy about the optimum methods of diagnosis, management, type of surgical procedure, and factors influencing surgical decision making.4,5 There are several graft choices for surgical reconstruction of the ACL. Bone-patellar tendon-bone autograft has been the most commonly used, but the use of semitendinosus and gracilis autograft is increasing. Although use of synthetic substances for ACL reconstruction has largely ceased, synthetic augmentation is still occasionally carried out.6,7

We felt that a national survey would help to establish the current practice of orthopaedic surgeons in the United Kingdom. This, in turn, may lead to the development of a unified approach towards the management of these injuries based on available evidence, and may also identify areas in which further research is needed. We surveyed 321 surgeons from the United Kingdom who, being affiliated to a specialist society of the British Orthopaedic Association, namely the British Association for Surgery of the Knee (BASK) or the British Orthopaedic Sports Trauma Association (BOSTA), have a manifested interest in treating such injuries.

Materials and Methods

A questionnaire consisting of six sections (a copy of which can be found at www.bjsportmed.com-supplemental) was sent to the surveyed population. It was based on the questionnaire used by Mirza et al.8 The survey was designed according to recommendations on survey design by Dillman.9 Section 1 related to the diagnosis of acute haemarthrosis. Sections 2, 3, and 4 consisted of scenarios of ACL injury in acute, chronic, and failed conservative treatment setting. Section 5 consisted of various factors involved in decision making for ACL surgery. Section 6 consisted of data on the surgeon’s workload, the higher surgical training scheme they had attended, and whether and where they had completed a fellowship.

The survey was mailed to the 321 orthopaedic surgeons in the United Kingdom who were members of the British Orthopaedic Association and belonged to one of two specialist societies, BASK and BOSTA. The addresses were obtained from the British Orthopaedic Association Handbook of 2000. The surgeons who did not respond to the first mailing were sent reminders at six weeks, and the remainder were sent faxed copies after a further six week interval. The results were scanned using Teleform (Cardiff Software) and were analysed using SPSS for windows (SPSS, Inc, Chicago, Illinois, USA).

The ACL injury scenarios presented in the survey were as follows.

- Scenario 1: A 22 year old university soccer player, with a five day old mid-substance tear of the ACL. There are no symptoms of a meniscal tear. He wishes to continue playing competitive soccer.
- Scenario 2: A 22 year old university soccer player with a ruptured ACL is seen one year after injury. There are no signs of a meniscal injury. The patient wants to continue playing competitive soccer.

Abbreviation: ACL, anterior cruciate ligament
• Scenario 3: A 22 year old university soccer player with a two year history of ACL insufficiency that has been treated conservatively has a giving way episode in a brace while playing a game. The patient wishes to continue playing competitive soccer.

RESULTS
The response rate was 60% (192/321). Twelve surgeons did not complete the questionnaire either because they no longer provided a knee service or they had retired. Most of the respondents (92%; 166/180) would investigate a haemarthrosis and follow those patients on their own, and the remainder would refer them to another surgeon. Most of the latter gave the reason for referring the patient as being involved chiefly with knee arthroplasty work. Some 44% (78/180) encountered less than 50 such injuries per year, and 73% (131/180) perform less than 50 ACL reconstructions per year.10 After determining the diagnosis of an acute ACL injury, 83% (150/180) would treat the patient themselves. Only 55% (94/170) of the respondents had completed a fellowship. Some 43% (75/173) were attached to a teaching institution.

Acute haemarthrosis was predominantly diagnosed with the help of history, clinical examination, and plain radiographs. A few of the surgeons (2%) use arthrocentesis. Magnetic resonance imaging (MRI) was routinely employed by 7% (12/180) of surgeons; 6% use it in private practice only, because of delays encountered in obtaining an MRI scan in the NHS. Most (63%; 114/180) would use MRI as a diagnostic tool if there was a possibility of associated damage to the menisci. Only 14% (25/180) of the surgeons routinely use arthroscopy for diagnosis of ACL injuries, whereas 71% (127/180) would use it in the presence of an acutely locked knee.

SCENARIOS
In the first scenario of a 22 year old man with an acute ACL rupture, 58% (89/154) of surgeons would recommend ACL reconstruction, whereas 24% (36/154) would treat the patient with rehabilitation and bracing. Another 18% (29/154) would advise rehabilitation for 5–12 weeks, followed by a reassessment. Of those who do recommend surgery, 30% (39/128) would operate when the patient has full range of movement of the knee even if this meant immediate surgery; 50% (65/128) would delay surgery even if the patient has full range of movement, and 8% (10/128) would operate irrespective of range of movement. A majority (57%; 76/132) of the surgeons preferred to use bone-patellar tendon-bone autograft, whereas 33% (44/132) would use semitendinosus and gracilis autograft. Only 1.5% (2/129) would attempt surgical repair. Ligament augmentation is not used by 97% (126/129) of surgeons, and 83% (108/129) do not incorporate the residual ACL stump in the repair. The reasons for incorporation of the stump were given as possible help in revascularisation of the graft or prevention of synovial fluid from entering the tunnel. For a similar scenario, 60% (86/144) would recommend ACL reconstruction for a female patient, whereas 37% (53/144) would treat her with rehabilitation and bracing. Some 48% (68/143) would treat a recreational soccer player with ACL reconstruction or rehabilitation and bracing. For an 18 year old non-athlete, 60% (85/141) would recommend rehabilitation and bracing whereas 35% (51/141) would perform an ACL reconstruction. For a 14 year old, 40% (57/141) would treat with rehabilitation and bracing, 30% (42/141) would perform an ACL reconstruction immediately, and the same percentage would perform ACL reconstruction after the physis are closed. For an 8 year old, 53% (72/135) would recommend rehabilitation and bracing whereas 32% (44/135) would perform an ACL reconstruction after the physes close; 14% (19/135) would perform an immediate reconstruction.

In the second scenario of a 22 year old with a chronic ACL deficient knee, 83% (121/146) of surgeons would recommend ACL reconstruction; 62% (85/137) would perform bone-patellar tendon-bone reconstruction, whereas 33% (46/137) would prefer a semitendinosus and gracilis autograft. In the scenario of failed bracing, 98% (145/148) recommended ACL reconstruction (fig 1).

Age in itself was not a factor affecting the decision to operate, or at least not for 63% (91/146) of surgeons. It certainly is not a factor that affects the type of surgery performed, with 82% (115/136) of surgeons not altering their strategy with age. Patellofemoral factors did not alter greatly the decision to operate, with 89% (129/146) of surgeons not influenced by this. The type of surgery in patients with patellofemoral arthritis was altered by 20% (27/138) of surgeons, with most opting for semitendinosus and gracilis reconstruction and avoiding bone-patellar tendon-bone reconstruction. An equivocal response was received with regard to moderate osteophyte formation with joint space narrowing, with 44% (63/144) taking it into account and 56% (81/144) not. Severe joint space narrowing leads 96% (139/145) of surgeons to reconsider their decision. Most surgeons would consider high tibial osteotomy or unicompartmental arthroplasty. The alignment of the knee did not appear to alter decision making in terms of proceeding to surgery: 59% (86/147) do not change their decision to operate on the basis of alignment, whereas 65% (89/138) would not change the type of surgery if malalignment were present.

DISCUSSION
This survey shows the variety of approaches in the diagnosis and treatment of ACL injuries in the United Kingdom. The diagnosis of ACL injuries in the United Kingdom is still made essentially with history, clinical examination, and plain radiographs.11 12 Arthroscopy and MRI scan is used routinely by 14% and 26% of surgeons respectively to diagnose ACL injuries. These figures may reflect the limitations of practice in the NHS set up rather than indicate the surgeons’ preferences. There were comments from surgeons indicating that they would like to use MRI scans as a diagnostic tool more often if it were more easily and quickly available. It is interesting to note the use of arthroscopy as a diagnostic tool.
by 14% of the surgeons, as arthroscopy is increasingly believed to have a therapeutic rather than diagnostic role in the management of ACL injuries. Over half (55%) of the surgeons would delay surgery for a certain period of time even if the patient had a full range of movement. This would be in line with the present published evidence suggesting that patients are more likely to get arthrofibrosis if operated on in the first one to two weeks after injury. However, 31% of the surgeons would operate on the basis of the patient having full range of movement even if it meant operating immediately. The vast majority of surgeons do not use any ligament augmentation. Some (16%) incorporate the remnants of the ACL stump, the most common reasons being supposed help with revascularisation and possible help with proprioception. This may represent the trend in the debate over the benefits and drawbacks of using the ACL remnants in the reconstruction. There is currently no conclusive evidence to suggest that one technique is better than the other. The sex of the patient does not alter the management, with a similar percentage of surgeons opting for ACL reconstruction for a similarly aged female patient.

There is considerable variation in the management of ACL injuries in children and adolescents. Only 14% of the surgeons who responded to the questionnaire would operate on an 8 year old with an acute ACL rupture; 32% would wait until the physis have closed, and 33% would treat these patients conservatively. In an adolescent patient with an acute ACL injury, 30% would operate soon, 30% would wait until the physes are closed, and 40% would treat with rehabilitation and/or braces. Only 15% would operate on an 8 year old with chronic ACL rupture. This is probably because of the potential risk of injury to the growth plate resulting in growth disturbance. Some of the recently published studies, on the other hand, suggest that children with ACL deficient knees tend to do considerably worse with conservative treatment."14,15 Most surgeons would not recommend surgery in the presence of severe joint space narrowing. Anatomical malalignment is not considered by 59% to be important in decisions about surgery.

Although this was a nationwide survey of ACL injury management practice in the United Kingdom, this study has some limitations. Only the BOA members who are also members of one of the specialist societies related to knee surgery—BOSTA and BASK members—were sent this survey. We do not know whether this population provides a true representation of the current practice of ACL injury management in United Kingdom. The response rate was 60%, which codified, and there is a considerable difference between North America, Australia, Continental Europe, and the United Kingdom. In North America, Australia, and Continental Europe, the indication for operative reconstruction seems to be more and more the tear of the ACL—that is, just the anatomical lesion—whereas functional instability—that is, the symptom produced by a torn ACL and present in only a proportion of patients with a torn ACL—is probably a more appropriate indication for surgery.14 This study may be extended to other English speaking nations to collate data on management of these injuries and it may be repeated to assess the effects of new evidence.

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REFERENCES
National Knee Injury Survey

Section 1 – Management of acute haemarthrosis

There are several possible diagnoses for an acute haemarthrosis of the knee. In this section we would like to know if and how you deal with this clinical finding in your practice.

Q 1.1 If you were to see a patient with acute haemarthrosis of the knee in your current practice (either in your clinic or in the Emergency Department), would you (please tick one)
1. Determine a specific diagnosis yourself and follow-up that patient’s care?
2. Determine a specific diagnosis yourself but refer that patient to another surgeon for follow-up?
3. Refer that patient to another surgeon without determining a specific diagnosis? (If so please go to Q6.1 to complete this questionnaire)
4. Other (please specify)

Q 1.2 Which of the following items do you routinely use (i.e. on every patient) in your investigation to determine a diagnosis for an acute haemarthrosis of the knee? (please tick as many as applicable)

1. History
2. Clinical examination
3. Plain radiographs
4. Arthrogram
5. Magnetic Resonance Imaging
6. Arthroscopy
7. Other (please specify)

Q 1.3 In what clinical situations do you use Magnetic Resonance Imaging as an aid to determine the diagnosis for an acute haemarthrosis? (please tick as many as applicable)
1. Routinely
2. Locked knee
3. Possibility of associated damage
4. Never
5. MRI is not available
6. Other (please specify)
Q 1.4 In what clinical situations do you use arthroscopy as an aid to determine the diagnosis for an acute haemarthrosis? (please tick as many as are applicable)

1. Routinely
2. Locked knee
3. Possibility of associated damage
4. If MRI is not available
5. Never
6. Other (please specify)

Section 2 – Management of acute ACL injury

One diagnosis for an acute haemarthrosis of the knee is an acutely torn Anterior Cruciate Ligament (ACL). Initial conservative management versus immediate repair/reconstruction is still debated in the literature. We would like to know what your approach to managing this injury is.

Q 2.1 After determining a diagnosis of an acute ACL insufficiency in a patient, do you (please tick one)

1. Deal with the patient’s care yourself?
2. Refer that patient to another surgeon? (if so please go to Q 3.1)
3. Other? (please specify)

Please consider the following clinical scenario and answer the relevant questions:

A 22 year old university soccer player is referred to your clinic. Five days ago during a game, he was running down the field and pivoted quickly to intercept the ball. He states that he heard and felt a ‘pop’ in his knee after which he fell with pain. He wishes to continue playing competitive soccer. Your diagnostic routine determines that he has a mid substance tear of the ACL with no meniscal tear.

Q 2.2 What would be your initial recommendation to this patient? (please tick one)

1. ACL repair and/or reconstruction
2. Rehabilitation and ACL brace prescribed for sports (if so please go to Q 2.4)
3. Other (please specify)
Q 2.3 A. If you recommend surgery, would you (please tick one)

1. Operate based on the patient having full ROM, even if it means immediately?
2. Operate irrespective of ROM?
3. Delay surgery for a certain period of time, even if the patient has full ROM on initial assessment?

Q 2.3 B. What type of surgery would you most likely perform? (please tick one)

1. Surgical repair only
2. ACL reconstruction using Bone-Patella Tendon-Bone (B-PT-B) autograft
3. ACL reconstruction using Bone-Patella Tendon-Bone (B-PT-B) allograft
4. ACL reconstruction using Semitendinosis/Gracilis (ST/G) autograft
5. ACL reconstruction using Semitendinosis/Gracilis (ST/G) allograft
6. Other (please specify)

Q 2.3 C. Do you use ligament augmentation such as gortex or propylene braid, in your reconstruction? (please tick one)

1. Yes
2. No

Q 2.3 D. Do you currently incorporate the residual ACL stump in your reconstruction? (please tick one)

1. Yes, because
2. No

Q 2.4 Please consider again the clinical scenario at the beginning of section 2. Would your initial recommendation for this type of injury change for the following selections? Please choose one of the following three options:

A. ACL repair/reconstruction
B. ACL reconstruction after physis closed
C. Rehabilitation and/or ACL brace

A  B  C

1. A female patient
2. A recreational soccer player
3. An 18-year old non-athlete
4. An 8-year old
5. A 14-year old with open physis
6. A recreational tennis player over 45 years of age
Q. 2.4 If the injury were a partial tear of the ACL, what would your initial recommendation be for the following selections? Please choose out of the following options:
A. ACL reconstruction
B. Rehabilitation and/or ACL brace
C. Other (Please specify)

1. The patient has ‘giving way’ episodes with pivoting manoeuvres  
   A  B  C
2. The patient does not have ‘giving way’ episodes

Section 3 – Management of chronically insufficient knee

The treatment of the chronically insufficient ACL in patients is debatable. The decision must be made to treat the patient surgically or non-surgically. If the surgical route is chosen then the type of procedure must be determined. In this section we would like to know the decisions that you make.

Q. 3.1 If you were to see a patient in either the clinic or the Emergency Department that you suspect has a chronically insufficient ACL, do you (please tick one)
1. Deal with the patient yourself?
2. Refer the patient to another surgeon? (If yes, please go to Q. 6.1 to complete the questionnaire)
3. Other? (please specify) ___________________________________________

Please consider the following clinical scenario and answer the relevant questions.

A 22-year old university soccer player is referred to your clinic. Last month, during a game, his knee ‘gave way’ as he pivoted on the field to intercept the ball. He recalls an original pivoting episode about one year ago when he developed an acute haemarthrosis. He wishes to continue playing competitive soccer. Your diagnostic routine determines that he has an ACL insufficient knee with no meniscal tear.

Q. 3.2 What is your recommendation to this patient? (please tick one)
1. ACL reconstruction
2. Rehabilitation and/or ACL brace prescribed (If yes, please skip Q. 3.3)
3. Other (please specify)
Q 3.3. A. If you recommend surgery, which reconstruction would you like to perform? (please tick one)

1. ACL reconstruction using Bone-Patella Tendon-Bone (B-PT-B) autograft
2. ACL reconstruction using Bone-Patella Tendon-Bone (B-PT-B) allograft
3. ACL reconstruction using Semitendinosis/Gracilis (ST/G) autograft
4. ACL reconstruction using Semitendinosis/Gracilis (ST/G) allograft
5. Other (please specify)

Q 3.3. B. Do you use ligament augmentation such as gortex or propylene braid, in your reconstruction? (please tick one)

1. Yes
2. No

Q 3.4 Please consider again the clinical scenario at the beginning of section 2. Would your initial recommendation for this type of injury change for the following selections? Please choose one of the following three options:

A. ACL repair/reconstruction
B. ACL reconstruction after physis closed
C. Rehabilitation and/or ACL brace

1. A female patient
2. A recreational soccer player
3. An 18-year old non-athlete
4. An 8-year old
5. A 14-year old with open physes
6. A recreational tennis player over 45 years of age

Section 4 – Management of failed conservative treatment

At certain times initial non-surgical, conservative measures for the ACL insufficient patient fail and dealing with these situations may be difficult. In this section, we would like to know how you treat these patients.

Please consider the following clinical scenario and answer the relevant questions.

A 22-year old university soccer player with a two year history of ACL insufficiency treated conservatively is referred to your clinic. During a game, his knee ‘gave way’ in his ACL brace when he quickly went to intercept the ball. He states that this is the third time this season and he wishes to continue playing competitive soccer. There are no signs of a torn meniscus.

Q 4.2 What is your recommendations to this patient?
Q 4.3. A. If you recommend surgery, which reconstruction would you like to perform? (please tick one)

1. ACL reconstruction using Bone-Patella Tendon-Bone (B-PT-B) autograft
2. ACL reconstruction using Bone-Patella Tendon-Bone (B-PT-B) allograft
3. ACL reconstruction using Semitendinosis/Gracilis (ST/G) autograft
4. ACL reconstruction using Semitendinosis/Gracilis (ST/G) allograft
5. Other (please specify)

Q 4.3. B. Do you use ligament augmentation such as gortex or propylene braid, in your reconstruction? (please tick one)

1. Yes
2. No

Q 4.4 Please consider again the clinical scenario at the beginning of section 2. Would your initial recommendation for this type of injury change for the following selections? Please choose one of the following three options:

A. ACL repair/reconstruction
B. ACL reconstruction after physis closed
C. Rehabilitation and/or ACL brace

A B C

1. A female patient
2. A recreational soccer player
3. An 18-year-old non-athlete
4. An 8-year-old
5. A 14-year-old with open physis
6. A recreational tennis player over 45 years of age

Section 5- Influence of patient factors on ACL surgery

There are several patient factors that may affect your decision to perform surgery or influence the type of ACL reconstruction you perform. In this section we would like to know how these factors are utilized in your decision.

Q 5.1 A. Do you consider age, by itself, to be an important factor in your decision to perform ACL surgery? (please tick one)

1. Yes (continue on Q 5.1 A 2)
2. No (please go to Q 5.1 B 1)
A 2. If you do consider age important, what is the age at which you would recommend treatment other than surgery? (please specify)

B 1. Do you consider age, by itself, to be an important factor in determining the type of surgery you perform? (please tick one)
1. Yes (please continue on Q 5.1 B 2)
2. No (please go to Q 5.2)

B 2. If you do consider age important, what is the age at which you would perform a different type of surgery? (please specify)

B 3. What type of surgery would you now perform? (please specify)

Q 5.2 A. Is the degenerative state of the knee a factor in your decision to perform ACL surgery for each of the following levels of classification? (please tick one for each category)

<table>
<thead>
<tr>
<th>Level</th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>Patello-femoral chondromalacia but no x-ray evidence of osteoarthritis</td>
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<tr>
<td>Moderate degree of osteophyte formation and/or joint space narrowing</td>
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<tr>
<td>Severe to complete joint space narrowing and/or flattening of the condyles</td>
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</table>

B 1. Is the degenerative state of the knee a factor in determining the type of surgery you perform for each of the following levels of classification? (please tick one for each category)

<table>
<thead>
<tr>
<th>Level</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patello-femoral chondromalacia but no x-ray evidence of osteoarthritis</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Severe to complete joint space narrowing and/or flattening of the condyles

B2 If you do consider the degenerative state of the knee a factor, how would you change the type of surgery you perform for each of the following levels of classification? (please specify for each category)

1. Patello-femoral chondromalacia but no x-ray evidence of osteoarthritis

2. Moderate degree of osteophyte formation and/or joint space

3. Severe degree of joint space narrowing and/or flattening of the condyles

Q 5.3 A. Is the anatomical alignment (varus/valgus) a factor in your decision to perform ACL surgery? (please tick one)

1. Yes
2. No

B Is the anatomical alignment (varus/valgus) a factor in determining the type of surgery you perform? (please tick one)

1. Yes
2. No

Q 5.4 A. Are clinical signs and symptoms of patello-femoral pain factors that you consider in your decision to perform ACL surgery for each of the levels of classification below? (please tick one for each category)

1. Mild
2. Moderate
3. Severe

Yes No

B.1. Are clinical signs and symptoms of patello-femoral pain factors that you consider in determining the type of ACL surgery you perform for each of the levels of classification below? (please tick one for each category)

1. Mild
2. Moderate
3. Severe

Yes No
B.2. What type of surgery would you perform for each of the levels of classification below? (please specify)

1. Mild 

2. Moderate 

3. Severe 

Q 5.5 A. Please state any other factors you consider important in your decision to perform ACL surgery.

B. Please state any other factors you consider important in determining the type of ACL surgery you perform.

Section 6-General evaluation

In this section we would like to know some general information about your practice and specialty training. This is to be used for demographic interest only.

Q 6.1 Approximately how many diagnoses of ACL insufficiency (acute or chronic) did you make in 2000?

Q 6.2 Approximately how many ACL reconstructions did you perform in 2000?

Q 6.3 Which registrar training did you attend?

Q 6.4 A. Did you complete a fellowship?

1. Yes
2. No

B. If yes, where did you do your fellowship?

Q 6.5 A. Are you currently affiliated with an academic centre?
1. Yes
2. No

B. If yes, which institution?

________________________________________________________________________

Please add your comments to this questionnaire here....

________________________________________________________________________

________________________________________________________________________

Thank you for your time and patience in filling in this questionnaire!