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Original Article

A national questionnaire survey on knee manipulation following total knee arthroplasty

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ABSTRACT

Background: Adequate range of knee motion is critical for successful total knee arthroplasty. While aggressive physical therapy is an important component, manipulation may be a necessary supplement. There seems to be a lack of consensus with variable practices existing in managing stiff postoperative knees following arthroplasty. Hence we aim to determine the current practice and trend among knee surgeons throughout the United Kingdom.

Materials and methods: Postal questionnaires were sent out to 100 knee surgeons registered with British Association of Knee Surgeons, ensuring that the whole of United Kingdom was well represented. The questions included whether the surgeon used Manipulation Under Anaesthesia (MUA) as an option for stiff postoperative knees; timing of MUA; use of Continuous Passive Motion (CPM) post-manipulation.

Results: We received 82 responses. 46% of respondents performed MUA routinely, 43% sometimes, and 11 never. Majority (71.23%) performed MUA within 3 months of the index procedure. 68% routinely used CPM post-manipulation while 7% of the respondents applied splints or serial cast post MUA. 41% of the surgeons routinely used Patient Controlled Analgesia ± Regional blocks. Majority (55%) never performed open/arthroscopic debridement of fibrous tissue for adhesiolysis.

Conclusions: Knee manipulation requires an additional anaesthetic and may result in complications such as: supracondylar femur fractures, wound dehiscence, patellar tendon avulsions, haemarthrosis, and heterotopic ossification. Moreover studies have shown that manipulation while being an important therapeutic adjunct does not increase the ultimate flexion achieved. Manipulation should be reserved for the patient with difficult and painful flexion in the early postoperative period.

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1. Background

Knee stiffness after total knee arthroplasty (TKA) is a common problem, occurring in 8%–60% of patients. Whilst pain relief is usually achieved following TKA, limited post-operative ROM secondary to stiffness could significantly compromise the restoration of function. There is currently no consensus in the literature on the definition, causes, and the management of progressively stiff knees following total knee arthroplasty.

The definition of knee stiffness varies within the available literature; Bong et al.¹ described it as limited range of motion (ROM) that affects a patient's ability to perform activities of daily living, Christensen et al.² described it as an arc of motion less than 70°, Kim et al.³ described it as a flexion contracture of >15° and/or <75° of flexion, whereas Yercan et al.⁴ defined it as >10° of extension deficit and/or <95° of flexion in the first 6 weeks after TKA.

The most common cause of post-operative stiffness is arthrofibrosis, of which the causes are multifactorial. The risk factors can be divided into pre-operative, operative and post-operative factors. Although post-operative factors such as poor patient motivation, lack of compliance with physiotherapy, deep infection, heterotopic ossification, post-operative pain and complex regional pain syndrome are recognised factors^{1,5}; pre-operative and operative factors remain the most recognised and debated topics in the current literature.

Treatment options of knee stiffness post TKA include; physiotherapy, manipulation under anaesthesia (MUA), arthroscopic debridement, open debridement, and revision surgery. While aggressive physical therapy is an important component, manipulation may be a necessary supplement. The most commonly used technique of MUA is general anaesthetic, muscle relaxants, and flexion of the hip and knee to achieve an improved knee flexion, however no agreed target range of motion exists.

There is still a lack of consensus in the current literature about the timing of MUA, clinical indications for MUA and patient selection. Hence we aim to determine the current practice and trend among knee surgeons throughout the United Kingdom.

2. Materials and methods

Postal questionnaires were sent out to 100 knee surgeons registered with British Association of Knee Surgeons, ensuring that the whole of United Kingdom was well represented. A stamped addressed envelope was provided for all participants. All participants were anonymised and their completed questionnaire immediately destroyed after statistical analysis.

As illustrated in Fig. 1, there were altogether eight questions in the questionnaire. The main questions we look into were how commonly do surgeons in the United Kingdom use MUA as an option for stiff postoperative knees; the timing of MUA; and the use of Continuous Passive Motion (CPM) post-manipulation. Basic statistical analyses were conducted,

Q1. MUA for postop stiff knees?

1. Yes
2. No
3. Sometimes

Q2. Timing of MUA?

1. Within 3/12
2. 3-6/12
3. After 6/12
4. Never

Q3. CPM post MUA?

1. Always
2. Never
3. Sometimes, when...

Q4. Splint/ serial casting after MUA?

1. Always
2. Never
3. Sometimes, when....

Q5. Postoperative PCA+/- Regional block?

1. Routinely
2. Only in selected cases
3. Decided by Anaesthetist
4. In None

Q6. Arthroscopic/ open debridement of fibrous tissue for adhesiolysis?

1. Always
2. Never
3. Sometimes, when...

Q7. Do you advocate long haul flights?

- 1.
- Yes
- No

Q8. Do you undertake mental health assessment on postop stiff knees?

1. Yes
2. No

Fig. 1 – Postal questionnaire.

with results expressed either as numbers or percentages rounded to the nearest full number.

3. Results

Of the 100 postal questionnaires sent out, we received a total of 82 responses. With no not able geographic pattern in those who declined to respond.

3.1. Manipulation under anaesthesia (MUA)

46% of the respondents ($n = 38$) performed MUA routinely, whilst 43% ($n = 35$) and 11% ($n = 9$) answered 'sometimes' and 'never' respectively. Of the 73 surgeons who performed MUA, majority 71%, ($n = 52$) performed MUA within 3 months of the index procedure. 19% ($n = 14$) performed MUA between 3 and 6 months, whilst only 1 of respondents performed MUA after 6 months. There was another group of six respondents (8%) who performed MUA depending on clinical picture. Of these 6 who manipulate based on clinical picture, 2 would consider manipulation up to 6 months and 4 would still beyond this time point.

3.2. Continuous passive motion (CPM) after manipulation under anaesthesia

Regarding the use of CPM post MUA, there was a 94% response rate. Of these 77 respondents, over 2 thirds (68%) routinely used CPM post-manipulation; 6% never used CPM, whilst 17% only when clinically indicated. The clinical indications for using CPM post manipulation for respondents are illustrated in Table 1.

3.3. Splint/serial cast after manipulation under anaesthesia

Only 7% of the respondents routinely apply splints or serial cast post MUA. Their indications for applying splints or serial cast after manipulation are illustrated in Table 2. Majority of respondents (93%) do not apply splints or serial cast post manipulation under anaesthesia of post TKR stiff knees.

3.4. Patient controlled analgesia (PCA) ± regional blocks

41% of the surgeons routinely used PCA with or without regional blocks. A group of surgeons (20%), only use PCA ± regional blocks in selected cases. They did not however specify the cases that they consider PCA ± regional blocks. It is the practice of 28% (n = 23) respondents where the need of postoperative PCA ± regional blocks was decided by anaesthetist.

3.5. Arthroscopic/open debridement of fibrous tissue for adhesiolysis

The majority of respondents (55%, n = 45) do not perform open/arthroscopic debridement of fibrous tissue for adhesiolysis. Only a minority (4%, n = 3) routinely performed debridement of fibrous tissue for the purposes of adhesiolysis, with two of the three respondents indicating that they undertake arthroscopic debridement. 41% of the respondents (n = 34) stated they only perform when clinically indicated, arthroscopic or open debridement of fibrous tissue.

3.6. Long haul flight

Majority of the surgeons (82%) allow their patients with stiff knees to take long haul flights, whilst 7.32% (n = 6) do not allow their patients to do so. 11% participants did not provide any answer to the question.

Table 1 – Response of indications for use of Continuous Passive Motion.

Indications for the use of CPM following MUA
Routinely
When available
If it was a complex primary
Stiffness
Limited progression
Low motivation patient
Low compliance patient
Inadequate physiotherapy service

Table 2 – Responses of indications for use of postoperative splinting.

Indications for use of splint following MUA
Flexion contractures
Fixed flexion
To maintain extension
To maintain extension as a night splint after

4. Discussion

Manipulation under anaesthesia of the stiff postoperative knee is commonly used by Knee Surgeons in the United Kingdom. The variation in practice of MUA amongst knee surgeons in the UK could well be explained by the difference in opinion about the causes of arthrofibrosis after total knee arthroplasty.

There are two differing school of thoughts about the causes and need for manipulation of the arthrofibrotic knee post TKA. Some authors suggested that arthrofibrosis and subsequent need for MUA are a result of poor surgical technique and postoperative pain management.^{4–6} Others reported suggested that knee stiffness and need for MUA are largely associated with pre-operative factors such as pre-operative range of movement, pain perception, previous knee operations, body mass index, diabetes and arthritis.^{7–10}

Poor postoperative pain control following primary TKA has been attributed to postoperative knee stiffness. Adequate pain control plays a crucial role in influencing the rehabilitation outcome. It has been suggested that increased knee pain in the postoperative period prevents knee flexion, therefore resulting in synovial/intraarticular adhesions and knee stiffness. Heuleu and Neyret et al. reported that adequate pain control after total knee arthroplasty reduces the incidence of manipulation from 9% to less than 1%.⁵

Another well recognised correctable cause of stiffness after TKA is surgical error and prosthesis design. Cuckler concluded in his article that stiffness after TKA is largely related to surgical technique, where 52 of 60 cases of stiffness were due to surgical errors.⁶ Several authors also suggested that the determination of a technical cause of stiffness would simplify treatment and avoid any unnecessary further intervention.^{2,4,5,11,12}

Final or mean gain in range of movement after manipulation under anaesthesia is still a contentious subject. Whilst some authors reported enduring gains in flexion following manipulation,^{7,13,14} another study reported that the gain in flexion was lost within one year after manipulation.⁸ Several authors have showed that patients with better pre-op flexion had more gain in flexion following manipulation.^{7,8} It has also been suggested patients who underwent MUA experience worse pain than the non-manipulated group, which persisted at 5 years follow up.⁷ Balancing the risk of gaining a sustainable range of movement and thus allowing a good quality of life, against the risk of causing postoperative pain following the manipulation procedure could be a difficult decision to make. These factors may also contribute to the variation observed amongst UK knee surgeons when it comes to manipulating the stiff knee after TKA.

As reported by Laubenthal, Smidt and Kettelkamp, in general 70° of flexion is necessary for the swing phase of gait, 90° to descend stairs, and 105° to get up from a low chair.¹⁵ Most authors in the current literature used knee motion less than 90° at 6 weeks as their clinical indication to perform MUA, whilst others use the regression or lack of progression in range of motion after total knee arthroplasty as an indication. Yercan et al.⁴ on the other hand recommended MUA in those without surgical error/implant failures only. Unfortunately, our study did not investigate the clinical indications of MUA amongst knee surgeons in the United Kingdom. Hence we are not able to report the trend amongst UK knee surgeons.

Mirroring the lack of consensus about the timing of MUA in the current literature, there is a variation in timing of MUA amongst our respondents. Some authors recommend MUA as early as 2 weeks after TKA,⁸ some as late as 3 months after TKA. The timing of MUA has been thought to influence the final gain in ROM in patients with stiff knees after TKA. It has also been theorised that later MUA needs to overcome intra-articular adhesions, thus making it more difficult to achieve better results. Yercan et al.⁴ and Daluga et al.¹⁶ reported better results when performed within first 3 weeks following TKA; however Keating et al.⁷ and Ellis et al.¹⁷ reported similar improvements with a more delayed manipulation. The vast majority of respondents in our study perform MUA within 3 months following TKA.

5. Conclusion

Knee manipulation requires an additional anaesthetic and may result in complications such as: supracondylar femur fractures, wound dehiscence, patellar tendon avulsions, wound dehiscence, haemarthrosis, pulmonary embolism and heterotopic ossification. Careful patient selection is therefore crucial. Manipulation should be reserved for the patients who have no surgical technical error or implant failure, who experience difficult and painful flexion in the early post-operative period.

There is not consensus on the indication or timing for manipulation under anaesthesia for knees following TKR. The vast majority of surgeons who responded to this survey considered it as a therapeutic option for post-operative stiffness. Most of these surgeons (71%) perform within 3 months and two thirds use CPM post operatively.

Conflicts of interest

All authors have none to declare.

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REFERENCES

1. Bong MR, Di Cesare PE. Stiffness after total knee arthroplasty. *J Am Acad Orthop Surg*. 2004;12:164–171.
2. Christensen CP, Crawford JJ, Olin MD, Vail TP. Revision of the stiff total knee arthroplasty. *J Arthroplasty*. Jun. 2002;17:409–415.
3. Kim J, Nelson CL, Lotke PA. Stiffness after total knee arthroplasty. Prevalence of the complication and outcomes of revision. *J Bone Jt Surg Am*. 2004;86-A:1479–1484.
4. Yercan H, Sugun T, Bussiere C, Selmi T, Davies A, Neyret P. Stiffness after total knee arthroplasty: prevalence, management and outcomes. *Knee*. 2006;13:2.
5. Heuleu JN, Neyret P. Conduite a' tenir devant les raideurs post-ope ratoires du genou. *Rev Chir Orthop Repar Appar Mot*. 2002;5, 1S27 – 51.
6. Cuckler JM. The stiff knee: evaluation and management. *Orthopedics*. 2002;25:969–970.
7. Keating EM, Ritter MA, Harty LD, et al. Manipulation after total knee arthroplasty. *J Bone Jt Surg Am*. 2007;89:2.
8. Fox JL, Poss R. The role of manipulation following total knee replacement. *J Bone Jt Surg Am*. 1981;63:357–362.
9. Tayot O, Ait Si Selmi T, Neyret P. Results at 11.5 years of a series of 376 posterior stabilized HLS1 total knee replacement. Survivorship analysis and risk factors for failure. *Knee*. 2001;8:195–205.
10. Scranton PE. Management of knee pain and stiffness after total knee arthroplasty. *J Arthroplast*. 2001;16:428–435.
11. Bellemans J, Banks S, Victor J, et al. Fluoroscopic analysis of kinematic of deep flexion in total knee arthroplasty. Influence of posterior condylar offset. *J Bone Jt Surg Br*. 2002;84B:50–53.
12. Chatain F, Marin F, Lavaste F, Skalli W, Neyret P. Influence of the height of the joint space on the three-dimensional kinetics of the total knee prostheses and behavior of the lateral ligaments: an in vitro study. *Rev Chir Orthop Repar Appar Mot*. 2002;88:803–811.
13. Esler C, Lock K, Harper W, Gregg P. Manipulation of total knee replacements. *J Bone Jt Surg*. 1999;81-B.
14. Maloney WJ. The stiff total knee arthroplasty: evaluation and management. *J Arthroplasty*. Jun 2002;17:71–73.
15. Laubenthal KN, Smidt GL, Kettelkamp DB. A quantitative analysis of knee motion during activities of daily living. *Phys Ther*. 1972;52:34.
16. Daluga D, Lombardi AV, Mallory TH, Vaughan BK. Knee manipulation following total knee arthroplasty: analysis of prognostic variables. *J Arthroplast*. 1991;6:119–128.
17. Ellis TJ, Beshires E, Brindley GW, Adams RL, Preece C. Knee manipulation after total knee arthroplasty. *J South Orthop Assoc*. 1999;Summer;8:73–79.