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MANIPULATION UNDER ANESTHESIA FOR STIFFNESS AFTER TOTAL KNEE REPLACEMENT: A SYSTEMATIC REVIEW

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ABSTRACT

Introduction: Stiffness of the knee joint after a total knee replacement (TKR) is a debilitating complication. Manipulation under anesthesia, arthroscopy, and open arthrolysis are used to treat the stiffness. **Objectives:** The main aim of the review was to answer certain following questions. What is the gain or benefit in range of motion (ROM) after for stiffness following TKR? Is the gain in ROM after manipulation under anesthesia for stiffness of the knee joint following TKR retained at the last follow-up? What is the gender distribution amongst the patients presenting for manipulation under anesthesia following TKR? What is the mean age of the patients presenting for MUA following TKR? What influence the timing have on Manipulation under anesthesia following TKR on the range of motion? The review was aimed towards establishing the current available evidence regarding manipulation under anesthesia for stiffness. **Materials and Methods:** A systematic review of the current available literature was applied or performed and the relevant studies were critically appraised. **Results:** Nine studies were noticed to be relevant to the review (1-Level 2; 2-Level 3; 6-Level 4). It was noticed that there was a good outcome in the range of motion after MUA and it was retained at the final follow-up of the patient. The patients presenting for manipulation under anesthesia were young and were predominantly female gender. Early MUA was found to be more effective, although late MUA was also beneficial. **Conclusions:** Unfortunately with limited and low quality of evidence, it is not possible to draw any conclusions.

KEYWORDS: Manipulation, stiffness, total knee replacement.

INTRODUCTION

Total knee replacement (TKR) gives satisfactory results in most patients with advanced degenerative changes in the knee joint.[1] Most common indications for this surgery are osteoarthritis (OA) and rheumatoid arthritis (RA).[2] Postoperative knee stiffness is a debilitating complication.[3] The definition of stiffness has been changing with time. This is due to the increasing expectations of the patients and the physicians.[4] It is defined as flexion contracture equal or greater than 10 degree or the arc of motion less than 95 degree.[5]

Earlier treatment of resistant cases of stiffness needed manipulation under anesthesia (MAU).[6,7] The main aim of this review was to integrate the information available from the studies related to this topic. To this end, the relevant studies were evaluated with a view to know the gain in range of motion after manipulation under anesthesia. Also, an effort was carried to know if the gain in ROM is retained or not. The complications following the MUA were evaluated as well.

Recent years, gender specific implants have been introduced and this has led to the debate if these implants really had any role or potential benefits.[8] It was noticed that females had more pain than male at 1 and 2 year follow-up.[9] It was also demonstrated that women had better outcome scores and had a lower rate of revision surgery as compared to the men.[10] It must be noted that anthropometric gender differences have been reported in the knee joint.[11,13] The anthropometric differences have been noted as the precise reason for gender specific implants. However, due to lack of adequate evidence to show the difference in the outcome raises certain doubts about their need.[14]

The motive of this review was to gain information regarding gender distribution among patients presenting for manipulation under anesthesia It has been suggested that the patients in the older age group did better as far as outcomes of TKR are concerned.[15,16] It is reported that main risk factor for poor outcome in primary and revision TKR is young age.[8] Others have said no relation between age and outcomes of TKR.[17]

One of the aims of the review would be to identify the mean age for patients presenting with stiffness of the knee joint. Knowing the gender preponderance and the mean age of TKR patients with stiffness will thus suggest patient characteristics with worse outcomes. Also, it will help in identifying the patients at risk for stiffness after TKR. It has been suggested that this data will be useful for policy makers, epidemiologists, and many surgeons.[8]

The main specific objectives for conducting the systematic review were as follows

- To find out the gain in the Range of motion after MUA for stiffness following a TKR.
- To verify or check if the gain in the range of motion after Manipulation under anesthesia was retained or not.
- To really know the ratio of male and female amongst the patients presenting for MUA.
- To assess the mean age of patients presenting for Manipulation under anesthesia following Total knee replacement.
- To assess the influence of the timing of Manipulation under anesthesia on increase in the Range of motion.

MATERIALS AND METHODS

The search was structured using the patient, intervention, comparison, outcome (PICO) format.[18]

Inclusion and exclusion criteria

Inclusion criteria

Adult individuals over 18 years of age with stiffness of the knee after the Total knee replacement who underwent manipulation under anesthesia were included in our study. Patients who had primary manipulation under anesthesia were also included in the study.

Exclusion criteria

Individuals with revision surgery, infected TKR, Manipulation under anesthesia after primary MUA, arthrolysis before or after the Manipulation under anesthesia, and a follow-up of less than one year after MUA were excluded from our study.

Search strategy

The searches were carried out between 14th November 2011 and 30th November 2011. Databases such as MEDLINE (1950 to 30th November, 2011), EMBASE (1980 to 30th November, 2011) and Cumulative Index to Nursing and Allied Health (CINAHL) (1981 to 30th November, 2011) were searched via National Health Service (NHS) Evidence (www.library.nhs.uk).

Keywords such as ‘arthroplasty’, ‘range of motion’, ‘manipulation’, ‘anesthesia’, and relevant synonyms were used for the search. Boolean operators such as AND and OR were used to combine the terms. The * truncation operator was used to retrieve variations of terms

(e.g., Stiff would retrieve stiff, stiffness, etc.). Thesaurus terms relevant to each database were also utilized. Studies were strictly restricted to humans and adults over the age of 18 years. The titles and the abstracts of these articles were viewed electronically with a view to select the articles for the search. If the title or the abstract was not clear, the article was retrieved and reviewed. Relevant and applicable articles were selected from the identified titles and abstracts and if necessary from the full text. Cochrane Library used to highlight any Cochrane Reviews (Cochrane Database for Systematic Reviews) and any non-Cochrane reviews were noticed through the Database of Abstracts and Reviews. The Cochrane library did not reveal any relevant review. A search through the Database of Abstracts and Reviews showed one review. In addition, the Cochrane Central Register of Controlled Trials (CENTRAL) was searched for the relevant trials. Additional databases like Tripdatabase (www.tripdatabase.com/) and Aggressive Research Intelligence Facility (ARIF) Database (www.arif.bham.ac.uk/) were also searched.

Other sources

Reference lists of included studies were also reviewed for other appropriate publications. Citation searching using studies identified as relevant to the review was undertaken using the Science Citation Index (www.isinet.com/). Dissertations and theses were searched using the ProQuest Dissertations and Theses Database website-www.proquest.co.uk/en-UK/catalogs/ databases/detail/pqdt.shtml (Higgins and Green, 2011).[18]

Research registers

To identify ongoing and unpublished trials, Current Controlled Trials were searched. Grey literature Databases like Open SIGLE (System for Information on Grey Literature) launched by Institute for Scientific and Technical Information (INIST), the National Technical Information Service (www.ntis.gov/search) and British National Bibliography for Report Literature (www.bl.uk/) were searched to identify additional grey literature.[18]

Search restrictions

The search was limited to humans only and restricted to patients over 18 years of age. Results 9 studies were selected for the systematic review. 6 studies were not included in the review. Five articles were rejected since the patients in these studies had a follow-up of less than one year. One of the studies was regarding the stiffness unresponsive to standard methods of MUA, that is, refractory to primary MUA and hence was not included in the review Daluga et al.,[6] found that the knees that underwent were significantly more predisposed to heterotopic

ossification. They further, found out that the overall flexion was better in the patients with heterotopic ossification than the rest of the patients who had MUA. Fox and Poss (1981),[21] in their study had five patients with complications following MUA (three hemarthroses, one wound dehiscence, one fatal pulmonary embolism). Keating et al., (2007),[20] found one complication in the form of a supracondylar fracture in their study. One patient, in the study by Rubinstein and DeHaan (2010),[25] had a superficial wound dehiscence. Fox and Poss, 1981.[21]

This retrospective case series reviewed the results of 81 patients who had MUA for stiffness following TKR.

The primary objective of the study is stated clearly. The study protocol is well-defined. There is no mention of any inclusion/exclusion criteria for this study. It is unclear if the patients were recruited consecutively. There was no effort at blinding the outcome assessors. However, it is felt that another outcome measure (in addition to ROM) in the form of a knee score which focuses on the function and pain would have been useful.

Also, it is not clear if the outcome was measured prospectively/retrospectively. It is not clear if the participants had signed an informed consent or not. Also, it is not mentioned that any ethical committee had approved the study. It is noted that the participants enrolled for the TKR were predominantly suffering from RA. Thus they do not represent the population, in general.

From the strength point of view, it is a weak design. Because of the retrospective nature of the study there may have been a selection bias. It can only generate hypothesis and clinical questions. However, it is not possible to arrive at any conclusion. Scranton, 2001.[23]

This is an observational study of 26 patients who had stiffness following TKR performed in a single center. It was treated using MUA, arthroscopy, and open arthrolysis.

Methodology: The recruitment criterion for the study is well-defined. The techniques of manipulation, arthroscopic debridement and modified open release are well described. An informed consent was taken from the participants before exposing them to any of the procedures. All the patients were followed-up for at least 1 year after the procedure. However, finally, only 19 patients were included in the study dealing with MUA. They were further divided into two groups depending on the timing of the manipulation. In essence, all

these have adversely affected the power of the study. This design is susceptible to selection bias.

There is a lack of clarity regarding the objectives, inclusion and exclusion criteria, outcome measures, and the assessors. Taking into consideration the biases involved, the power of the study and thus the applicability of the study, it is not possible to draw any conclusion.

Each article was read carefully. A data extraction sheet was formulated. It included prevalence of stiffness, diagnosis of the patients presenting for manipulation, mean age, and gender distribution. It included details regarding the intervention like indications; description of the MUA, anesthesia used, and any other protocols used during or after the MUA. The data extraction sheet also comprised of questions to know the degrees of ROM before, during, and after MUA. Also, the length of follow-up and the timing of MUA were looked at. This data is presented in the form of charts.

The level of evidence of the nine studies was decided using the guidance provided by Centre for Evidence Based Medicine, Oxford, United Kingdom (http://www.cebm.net/index.aspx?o = 1025). One study,[19] was a level 2 study. Two studies,[6,20] were designated as level 3 case control studies. The remaining six studies were level 4 retrospective case series. This was followed by quality appraisal of the studies.

The prevalence of patients presenting for MUA varies from 1.8,[20] to 23%.[21]

The predominant diagnosis in the patients presenting for MUA was OA.

In all the studies, it was found that the patients presenting for MUA following a TKR were predominantly females. The mean age of patients in the nine studies was between 53 and 71 years.

The technique of MUA was similar across all the studies. Some of the studies used an additional intra-articular injection of steroid/epinephrine/local anesthetic or a combination during the MUA.[22-24]

Post manipulation different protocols like ice, continuous passive motion (CPM), physiotherapy (PT) steroid tablets, pain control measures, etc., were used by different

authors. The procedure was predominantly done under general anesthesia (GA) with an additional muscle relaxant in some studies.

In all the studies considered for the review, there was a definite gain in the ROM. This was variable from 26,[22] to 47°.[5]

The post manipulation ROM was not reported in three studies.[22,23,25]

The range of motion (ROM) gained at MUA was retained at final follow-up in four studies.[5,6,19,24]

Patients in three studies gained motion.[6,19,24]

In three studies, the gain in ROM was lost at final follow-up.[20,21,24]

Keating et al., (2007),[20] have noted a mean loss of 6° of flexion. However, there was no clarity if this loss of ROM was statistically significant or not. The population mix (predominantly rheumatoid) for the TKR in the study by Fox and Poss (1981),[21] was not a representative of the general population.

The results of these studies suggest a relationship between the timing of MUA and the gain in ROM. Five studies have indicated that early manipulation is more effective than late Manipulation.[5,6,19,22,23]

It must be noted that they the late group patients also benefitted from the MUA.

Six studies have not reported any complications.[5,6,19,22-24]

In their [Downloaded free from http://www.joas.in on Thursday, July 19, 2018, IP: 27.62.109.146] Nawghare and Brooks: MUA for stiffness after TKR: A systematic review 10 Journal of Orthopedics and Allied Sciences | Jan-Jun 2013 | Vol 1 | Issue 1 | Sharma et al., 2008,[24]

This is an observational study where two groups of patients who had TKR were exposed to different protocols for pain management and the results were compared. In addition, the patients in these groups who developed stiffness were exposed to different protocols during the MUA.

It is a well-designed and retrospective study. There is an attempt made by the authors to limit bias by reporting in detail about the intervention and the post intervention protocols. Patients were enrolled consecutively and there was a long follow-up without losing any patients to follow up. The outcome measures included validated outcome measure like Knee Society Score. To be noted that by its inherent nature a retrospective study is exposed to a selection bias.

There is no mention of blinding of the assessors. Without a control group, it is not possible to reach to any conclusion from this study.

In addition, as the power of the second component of the study is low, it is not possible to draw any conclusion.

Rubinstein and Dehaan, 2010,[25]

This retrospective review of 37 patients with stiff knees following:
TKR was conducted to establish if there was any association between pre-TKR and post-MUA ROM.

Methodology: It is a retrospective study. The participants seemed to represent the population. All the participants were recruited in the study at the same time. The patients were selected consecutively. The outcome was measured prospectively. The protocol of the study was defined elaborately. The intervention of manipulation has been described adequately. It was carried out by an experienced surgeon and was done in appropriate surroundings. The follow-up was long enough to detect important effects. None of the patients were lost to follow-up.

The only outcome measure utilized for the study was the ROM. An additional outcome measure which takes into consideration pain and function of the knee would have been appropriate. It has been noted that the chart (details) of one patient were not available.

This increases the chances of an attrition bias in the study. The design of the study is reasonable. It is an observational study. It is a retrospective case series. The authors would have to depend on the accuracy and availability of medical records. As the authors have selected the cases themselves, it introduces an obvious selection bias. In addition, in this experiment, there is no use of control subjects. Inability to blind the participants and the

clinicians introduces performance and measurement biases in the study. Given the number of biases that the study is prone to, the conclusions drawn from the study cannot be generalized. The conclusions drawn from the study should be used to generate a hypothesis which needs to be tested by more robust prospective study designs. Cates and Schmidt, 2009.[22]

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