

Total knee replacement post op pain management



**ASSIGN
BUSTER**

To improve the quality and mobility of life, the most frequently used operative procedure is the total knee replacement. But it is necessary to administer the pain relief measures in the post operative period which would allow the ambulation and reduce the post operative complications. It is important to consider the pain relief options provided in the text with reference to the possible adverse affects in each case.

Objective

The main objective is the identification of the most suited method for the post operative pain control after the Total Knee Replacement Surgery.

Methodology

The random control trials executed on adult patients with the Total Knee Replacement Surgery was identified by going through the databases of MEDLINE, PUBMED, COCHRANE and CINAHL from the year 2000 to the present year.

Results

The patients involved in this study had pre operative and post operative osteoarthritis diagnosis. The continuous pain arising due to the arthritis can be eliminated by the total knee arthroplasty treatment. The use of femoral nerve blockade can be used to treat the pain after the total knee arthroplasty. Reduced oral opioid were taken in by the patients with primary, unilateral, noncemented total knee arthroplasty. These patients are also known to take less stool softener as a post operative measure and have increased mobilization. The patient's poor health often resulted due to the obesity

which led to a modifiable co-morbidity as was shown by the higher classification of the ASA.

Conclusion

Until now no adequate solution has been found to the pain after the Total Knee Replacement surgery. Although some consideration could be given to the combined femoral nerve block, the author however supports the use of multimodal approach in the control of postoperative pain in the TKR surgery. This method should be administered keeping in mind the clinical status of the individual patient, availability of skilled technicians and adequate equipment. Contents Page

1 Introduction

Pain according to the International Association for the Study of Pain, has been described as an unpleasant emotional and a sensory experience that is often connected to an actual or a potential damage or is a sense that may be described in terms of that damage (Merskey, 1986).

Although much advancement have been made in the study of mechanisms and their treatment, still they scientists have been unable to find the appropriate solution to postoperative pains (Joshi and Ogunnaike, 2005). If the inadequate methods of relieving pains are administered, then this may cause damage to the physiological and psychological workings and the patient may need more time to recover and return to the daily life (Gottschalk and Smith, 2001; Joshi and Ogunnaike, 2005). The most dreadful consequence can be death itself. In addition patients are complaining about the post operative symptoms such as pain which results due to the

anesthesia or any surgical procedure. It is also an established fact that a postoperative pain treated inadequately can inculcate into a chronic pain which may be not diagnosed properly and will lead to its negligence (Joshi, and Ogunnaike, 2005). The health care costs and the resources are required more in these cases (Phillips, 2003). It is important that steps be taken to improve the control of preoperative pain which is a much better option and will lead to the reduction of post operative morbidity. This will therefore increase the standard of health associated quality of life and will also benefit the health sector economically.

Theory of Pain

The Gate Control Theory was established by Melzack and Wall (1965), to explain the differences in the perceptions of the similar stimuli. These scientists believed in the existence of some sort of a gate in the spinal cord that would open in specific situations and allow the passage of the nerve impulses linked with the pain stimulation which was then read by the brain as a sensation of pain. They also believed that certain psychological factors such as the anxiety would also affect the degree of the opening of the gate. Therefore in order to minimize the pain the theory was based on the idea of closing this gate. According to the Gate Theory, it was possible to control the transmission of the pain impulses through a gating mechanism present along the nervous system. The pulses can move in both the direction both up and down the nervous system. This means that the whole nervous system is involved in the perception of the pain response (Suza, 2007).

Physiology of Pain

The basic process of the pain transmission is Nociception. According to Loeser and Treede (2008), the Nociception is the neural process of encoding and the process of noxious stimuli. The mechanical, thermal or the chemical changes when surpasses the set limit, then they can be detected by the nociceptors or the pain receptors. The nociceptors transmit a signal along the spinal cord after its stimulation, to the brain which is then perceived by the brain as a sensation of pain (McCaffery and Pasero 1999).

Pathophysiology of pain

The sympathetic nervous system is activated by the stress responses in which the body is alerted to the existing harm. This denotes that the stress responses are a protective measure by nature. Through the stress responses the damages like blood loss is minimized as well as the perfusion to the vital organs will be maintained, healing will be enhanced and prevention to infections will also be carried out (Singh, 2003). But if the pain is prolonged then harmful consequences may be caused to the multiple systems of the body.

A calculated amount of the hormones are released by the endocrine system which are responsible for the conversion process and the utilization of the carbohydrates, proteins and fats. Excessive amounts of these hormones are released by the endocrine system when the person is under stress. These hormones include Cortisol, Growth hormone, Adrenocorticotrophic hormone, Antidiuretic hormone, Catecholamine and Glucagon. Tachcardia, fever, shock, increased rate of respiration and some severe results leading to death may be produced by the combination of the inflammatory process, endocrine

<https://assignbuster.com/total-knee-replacement-post-op-pain-management/>

and the metabolic changes. The stress responses are prolonged by the pain and physical changes and may severely affect the recovery of the patient from the situation of trauma (McCaffery and Pasero, 1999).

The sympathetic nerves system is activated as a response to the stress by the cardiovascular system. A number of affects are caused by the activation of the sympathetic nervous system in the post operative period, such as; increase in the heart rate, hypercoagulation due to the decrease in the fibrinolysis, blood pressure, oxygen demand and a cardiac workload. Major impacts of the hypercoagulation may be seen on the morbidity and the mortality as these may be connected to the infarction, irregular angina and myocardial ischemia. The risks of pulmonary embolism may be increased due to the deep venous thrombosis (DVT) which is generally associated with the surgical procedures and an absence in the movement postoperatively.

The respiratory system affects of the severe pain can be calculated in terms of the high inspiratory and expiratory residual capacity, tidal volumes and the alveolar ventilation. If the controlling measures applied to the postoperative pain are not adequate then the adverse respiratory affects can convert to severe pulmonary complications in the form of atelectasis and pneumonia (McCaffery and Pasero, 1999).

The urine outputs, electrolyte balance, other fluids are regulated by the hormones in the Genitourinary System. These hormones also control the blood volume and the pressure. These hormones may include ADH, cortisol, angiotensin II, catecholamine, prostaglandins and aldosterone. If the pain is not relieved then it may lead to the excess release of the hormones which

can cause the water and the sodium ions to be retained, the functional extracellular fluids are decreased with the fluids being moved to the intracellular compartments and the excess excretion of the potassium ions. Among the harmful effects are: decrease in the urinary output, increase in the cardiac workload, urine retained, hypokalemia, hypertension and the overloading of the fluids (McCaffery and Pasero, 1999).

The activity of the sympathetic nervous system is increased due to the stress responses which affect the Gastrointestinal System, increase in the smooth muscle sphincter tone, intestinal secretion and the decrease in the gastric disposal and intestinal motility. These may lead to the gastrointestinal function to be temporarily impaired (McCaffery and Pasero, 1999).

The pain in the Musculoskeletal System may lead to the impairment of the muscle function, muscle spasm, immobility and fatigue. The short and the long term recovery can be affected by the inadequate control of the pain after the execution of an orthopedic surgery as this may create interference in the patient's performance of the physical therapy exercises (Choy, Bandar, Scott and Dockets, 2010). The hospital stay for the patient may be prolonged as a result. The time duration spent by the patient in the hospital indicates the patient's satisfaction level. Patients who had a short stay were found to be more satisfied as compared to those with longer hospital stay.

The Immune function can be suppressed by the pain (page 2000) which will make the patient more vulnerable to postoperative infections such as pneumonia, sepsis and the wound infection.

The severe acute pain or the pain which is prolonged can affect the Cognitive function which will make the patient to undergo some behavioral changes such as the increased sensitivity to the external stimuli like light and sound. Individuals may react by withdrawing themselves from interpersonal interactions and an increased indulgence in one's self concern (NHMRC, 2005). If the pain is not relieved the patient may experience a loss of control over the environment such as the expression of anger and resentment which may make the patient believe that the treatment is being delayed (Joshi and Ogunnaike, 2005).

Postoperative pain control

The surgical pain should be appropriately managed owing to the negative effects that it has on the physical and the psychological system of the postoperative patient. The following methods have been applied in the Total Knee Surgery in the practice area of the author in the area of orthopedic surgery:

Systemic Opioids

The treatment of moderate and acute pain can be done through opioids which is still the main systemic analgesia. Titration is needed to estimate the individual needs as the opioids requirements differs from one patient to another with respect to dosage. The most effective pain relievers are the opioids but they are generally not desired by the patients or the doctors due to the wide ranging adverse effects (NHMRC, 2005).

Paracetamol

To treat the post operative pain, paracetamol was introduced as an analgesic and antipyretic. The use of opioid was reduced by 20-30% by the usage of paracetamol and the level of patient satisfaction was also increased. The postoperative pains are also affectively dealt with the combination of Non-Steroidal Anti-inflammatory drugs (NSAIDs) and the opioids. The NSAID's are effective analgesics, anti-inflammatory drugs and antipyretics. The NSAID's are also helpful in reducing the usage of opioid, but the adverse effects associated with this drug has made the clinicians extra careful when using it.

The method in which the patient can administer the analgesics as needed is referred to as the Patient Controlled Analgesia (PCA). Although this term may be more frequently associated with the programmable infusion pumps that administer the dose for the opioid medication intravenously (Morgan, et al. 2006).

The cumulative doses of the drugs are decreased in comparison to the continuous epidural infusion by the usage of Patient Controlled Epidural Analgesia which contains Bupivacaine and Fentanyl. This may be done without any difference seen in the side effects or the relief of pain.

The duration of the postoperative analgesia is extended beyond the duration which is generally available in a single injection by the help of Continuous Peripheral Nerve Blockade (CFNB). The technique utilized in the nerve location, the typology of the continuous catheter, local anesthesia, equipment and the management is some of the technical issues that are brought under consideration.

The CFNB is sometimes referred to as the 3-in-1 due to the triple benefits that it offers as when the catheter is positioned in the femoral nerve sheath, it will allow the penetration of the local anesthesia to the lateral femoral cutaneous, the obturator nerve and the femoral nerve block (NHMRC, 2005).

Total Knee Replacement (TKR)

The patient suffering from acute pain and unstable knees, in order to gain a pain relief and a functional movement, requires a total Knee replacement surgery. Prophylaxis and early mobilization can reduce the complications and morbidity caused after the surgical procedures.

Prophylaxis

According to Palmer (2010), in the absence of prophylaxis there was an occurrence of 40-88% of deep venous thrombosis (DVT) after the TKR.

According to Palmer several methods can be applied to reduce these risks such as low dose of warfarin, mechanical compression stockings, heparin of low molecular weight and aspirin.

Mobilization

A rapid recovery to the normal functions after surgery can be done through postoperative mobilization. If the postoperative pain is not relieved then it will lead to late mobilization which will increase the DVT risks, chest infection and pulmonary embolism. If the chest infection is concurred, then the static secretions will lead to atelectasis and pneumonia (Bone and Joint, 2009).

3 Methods

The method of study was primarily based on the extensive literature review of the publications which were related to the management of postoperative pains in adults who have undergone Total Knee Replacement Surgery. The method was more preferred by the author due to limited clinical access to the patients as the author is an international student. This method was also chosen under the light of the statement by Aveyard (2007), who said that the literature review is able to provide a complete picture and helps in forming a systematic approach towards the study's answer. Therefore the study will include as many options available from the literature review as possible.

Search strategy

The Cardiff University's electronic database was used as the source to gain data on the most effective method used in the post operative pain control after the Total Knee Replacement Surgery. The search gave 246 hits with the keywords used such as Pain, Analgesia, Anesthesia, postoperative and Knee. Among these results the author selected the most relevant options with the help of Medline Ovid. The search was limited to the English language due to convenience in understanding this language as compared to the others and included results from the year 2000 to the present. The appendix 1 shows the details of the research strategy.

Scope of the study

The inclusion of the data in the study was based on adult human beings and total knee replacement surgery. The pediatric and other surgical specialties

were not included in the research as was the study involving non human subjects.

Data collection

The MEDLINE, PUBMED, COCHRANE and CINAHL were the primary source of information. The Critical Appraisal Skills Programme criteria were used in the judging of the key methodological points considered in the Randomised Control Trials (PHRU, 2006).

Data analysis

In the published materials, broad themes were identified and studied with the most common and frequently used methods of pain relief resulting for the Total Knee Replacement Surgery were compared and analyzed with each other. The adverse effects of these methods were also considered in the analysis.

The results were analyzed under the CASP (PHRU, 2006) criteria which was developed by the Center of Evidence based Medicine (CEBM, 2011). The appendix 2 shows the appraisal sheet.

3 Results (Review of the literature)

A double blinded Randomized Controlled Trial was conducted by Kardash et al (2007), for the comparative analysis of the obturator with the femoral nerve block used for the analgesia after the Total Knee Replacement surgery. This was done by using at the surgery's end the spinal anesthesia with the femoral, obturator or the placebo nerve block. The study consisted of 60 patients who were divided in treatment groups of varying sizes. The

participants and the collectors were not aware of this allocation at all. All the patients were present in the study except for one patient who was removed from the study due to the confusion of the patient in the recovery room postoperatively. The patients were given a follow up after 48 hours of post surgery. The pain scores were found to be lowered after the femoral nerve block as compared to the obturator nerve block. But no difference was found in the groups after 48 hours related to pain or baseline among the groups. There was an absence of a significant difference between the groups with the pain score of $p = 0.03$ as an option. This would favor mobilization of the femoral block over the obturator block. The data is widely represented as shown by the demographics of the total knee replacement population. The findings could not be generalized owing to the small size of the groups.

A prospective randomized placebo controlled single blind study was executed by Macalou (2004). The assigning of the patients into three groups was done randomly through envelopes given to the patients. A femoral nerve block (FNB) was given to group 1 while combined and selective obturator nerve block, FNB= 33 was given to the group 2. The group 3 was given the placebo FNB ($n = 28$) with a total of 90 patients enrolled in the study.

The three groups demonstrated no significant demographic differences. All the participants were present in the study without any dropouts and there was no failure of the block experienced which makes the study even more valid.

In the first 6 hours the patients were monitored postoperative. The administration of the Patient Controlled Analgesia was initiated post

anesthesia without the recording of any symptoms of pain in the first 6 hours. The study follow ups are from 24 to 48hours which means that the duration of the study of 6 hours is not sufficient to obtain any conclusions. 3 tables and 1 graph presented the study. The results obtained in the first 6 hours after the surgery showed the morphine boluses given through the PCA were consumed in a lesser number in group 2 as compared to the group 1 and 3 ($P < 0.001$). A lower visual analogue scale of the pain was reported in group 2 as compared to the group 1 and 3. There was no difference observed in the pain scores or the morphine consumption between 1 and 3. The group 1 and 3 had more occurrence of nausea . therefore where there was no confidence interval value reported, the P value was reported.

The sample size of 90 participants was clear due to the absence of any discussions on the power calculations. It was felt that the 6 hours of the study were insufficient to analyze the pain level and the side effects of the postoperative study. The aspects mentioned must be considered before an attempt is made on the application of the findings to another clinical setting.

A prospective randomized blind study was also conducted by YaDeau in 2005. The computer generated random numbers and closed envelopes were used to divide the patients into two groups. The group to which the patients were assigned was hidden from the patient, pain management team, chart analysts and the physical therapists. Femoral nerve block (FNB) was given to the group 1($n = 41$) and the epidural analgesia. There were in total 39 patients who received the epidural analgesia alone.

The two groups had no significant demographic differences and all the participants were accounted for at the end of the study.

All the patients had the absence of numbness, the combined spinal epidural blockade and

Weakness associated with the FNB. A standard pain service protocol was used to follow up the patients who required the repeated documentation of the pain, sedation, nausea, confusion and pruritus. The determination of the visual score analog scale (VAS) pain scores was done by the nurses who repeated this task every 2 hours for up to 72 postoperative hours. The size of the calculated sample (sigma stat, landel Scientific) utilizing the published data showed that 80 patients indicated a power of 0.838 for the detection of 10° difference in the mean flexion ROM on the second day. There was a deviation of 15 degrees standard deviation of 0.05. The validity of the study was strengthened by the representative sample of the participants. 3 graphs were used to represent the results such as the patients who were given the FNB with physical therapy on the first postoperative day had the lowest VAS score (Pvalue= 0.045) and the patients who were given a FNB were observed on the second day of the postoperative day to show a significant improvement in the flexion ROM.

This group did not show any significant difference in terms of side effects. There were reports of nausea occurring one or more times in first few days post-operatively in 27 % of patients with FNB whereas 28 % patients on control also experienced the same side effects. P value was given there was no discussion about the confidence interval. The study, however, suggested

that the addition of FNB to epidural analgesia actually improves the analgesia in cases of total knee replacement surgeries.

In 2004 a randomized, double blind placebo controlled study was conducted by Szczukowski et al. This study comprised of 40 participants which were selected by research randomizer process. The 40 participants were divided into 2 groups consisting of 19 and 21 patients in group A and B, respectively. Both groups did have uniform distribution of demographics and no patient withdrew from the study. This shows that the blocks were successful. The participants were followed-up for 4 days after surgery. The author described the size of the sample as the power to identify the differences of the primary variables (the total amount utilized within 24 hours) and the FNB group (48.1 mg morphine) in which the sham nerve block (76.2 mg morphine) was found to be 77%. The exact number of the participants indicated the best results.

3 graphs presented the data with clarity. Morphine was more used in the group B (76.2mg) as compared to the group A which had used 48.1 mg of the morphine in the first twenty four hours after the surgery ($P= 0.03$). There was a significant difference in the results of the group B's sedation scale ($P= 0.013$). In the first 24 hours it was seen that the results of group B averaged to 4.78 in comparison with the group A's 3.67. Significant difference was seen on the day of the surgery when the results were analyzed according to the individual days. The score of Group B was 6.00 in comparison to the results of the group A result which was 4.7 ($P= 0.002$). The two groups showed no difference in the degree of ambulation, motion range or the stay length.

In spite of the recording of the P value there was no discussion done on the confidence interval. Hence the degree of error cannot be determined which puts the reliability of the study in doubt.

The observations and findings from this study suggest that post-operative analgesia can be improved by a single injection femoral nerve block. It is safe and simple and is more importantly reliable.

Sites et al (2004) conducted a prospective randomized clinical study in which the 41 ASA physical status 1-111 patients were divided into categories on the day of the surgery in two treatment groups. The criteria for exclusion was as follows: pregnant, 18 years of age, allergy to any drugs, chronic obstructive lung diseases, chronic opioid usage, chronic pain syndrome which is not related to the knee pathology or the contraindication to intrathecal or regional analgesia. These criteria for exclusion seemed to be fair. One of the patients was omitted from the study due to the failure of the femoral nerve block with no significant demographic differences identified between the groups. All the participants were present in the study and its conclusion in which the patient with the block failure was an exception. The research nurses were collecting the data postoperatively at 1, 2, 4, 6, 12, 24 hours. The most important result deduced was the usage of the IV morphine in the first 24 hours which used the derivation of 22mg of morphine on a group of 20 patients. In this way each group would give an approximately 82% power of the detection of the difference of 20mg of IV morphine usage. The results show that the size of the sample indicates everything. 4 tables were used to display the results and out of these one table showed the cumulative IV morphine consumption and the VAS score at the varying time

<https://assignbuster.com/total-knee-replacement-post-op-pain-management/>

intervals. The groups showed no statistical differences during the time intervals. The intrathecal morphine (ITM) group was given 75+ 6mg and the FNB group was given 72+ 7mg of IV ketorolac ($P > 0.05$).

The ITM group showed an increase in the occurrence of nausea, pruritus and vomiting. About 20% of the patients in the ITM group in the follow up satisfactory survey rated their anesthetic experience as not satisfactory. These were considered in comparison with none in the FNB group ($P = 0.035$). The validity and reliability of the study was enhanced by the reporting of the P value and the confidence interval.

Equal amounts of the postoperative analgesia were experienced but the fewer side effects were seen in the FNB group such as nausea, itching and vomiting. Less level of satisfaction was observed among patients receiving T morphine. However the interventions were not sufficient to provide the completed postoperative analgesia.

A randomized controlled trial was conducted by Davies in 2004, in which the 60 patients who underwent unilateral primary total knee replacement surgery were included in one of the two study groups. The continuous epidural analgesia was given to the group 1 until a single shot combined with sciatic plus femoral which is available in 3 in 1 combined block.

The research used a random number generator, Arcus Quickstat version 1.0, to divide the participants in groups in which a third party would store the codes in sealed and opaque envelopes which would reduce the chances of bias (Parahoo, 2006). The exclusion of the patients was done on the following basis: local anesthesia, $ASA > 3$, neuraxial blockage or the use of
<https://assignbuster.com/total-knee-replacement-post-op-pain-management/>

tourniquet, contraindications to use the non steroidal anti inflammatory drugs, pain poly analgesia. The criteria used for the exclusion seemed to be correct. All the participants were present in the study and in the conclusion. The failure to locate the epidural space led to the exclusion of one patient. After the exclusion the analysis was done but no difference in the results were seen in the analysis on an intention to treat the basis. The data collection was done in a similar manner and the follow up was carried out. A performance bias was created by the inconsistencies. The analysis of the patients was done for the pain assessment after 48 hours postoperatively with the use of a visual analog VAS. The power analysis was used to determine the sample size, obtained from a lower limb neural block study which showed the 10mm VAS difference. A risk of 0. 05 was obtained in group A and a risk of 0. 2 was obtained in group B. a minimum of 24 patients would be sufficient for the study. In each group 30 patients were however recruited to make up for the incomplete data collected and to make sure that the validity was ensured. 3 tables and 3 graphs were used to demonstrate the results. An absence of a statistical difference between the two groups was seen in the two groups for the block insertion time ($P= 0. 92$). The dose given for the fentanyl was to be same.

In both the groups the score for the pain was higher than 24 and 48 hours. A greater number of the patients were found in the epidural group with the completed recovery of the analgesia. There was no pain reported in the 0. 23 of 39 patients when a movement was attempted as compared to the 16 out of 30 patients form the block group.

The scores of the level of satisfaction were found to be high in both the groups with an increased tendency of the statistical significance which was found to favor the block group at 48 hours. The validity of the study was increased with the discussion of the P value and the confidence interval. A practical alternative to the epidural analgesia was offered by the combined block for the total knee replacements. The results can be applied to the clinical setting.