Pain Management for Joint Replacement Cases – Physiotherapy Perspective

Ada Tsui, Physiotherapist I, Hong Kong Buddhist Hospital

Introduction

Total joint arthroplasty is considered as one of the most successful surgical procedures to relieve pain and improve physical function for patients with severe osteoarthritis of knees or hips. In Hong Kong, there are about 6,000 total knees or total hip arthroplasty operations performed in public hospitals yearly. Adequate and appropriate post-operative pain management allows faster rehabilitation, reduces risk of complications and hence, associated with shorter length of stay in hospital (Parvizi et al, 2011). However, after hip or knee arthroplasty, a significant proportion of patients experience certain period of pain which may persist for months. Previous studies showed that at least 7%-23% of patients experienced long-term pain after hip arthroplasty and at least 10%-34% of patients had long-term pain after knee arthroplasty (Beswick et al, 2012). In order to improve the quality of the outcomes after total joint arthroplasty, multimodal pain management is used to tackle the pain. This is a multidisciplinary approach with input from surgeons, anesthesiologists, as well as physiotherapists. Surgeons and anesthesiologists work much during the pre-operative period, during operation and post-operative period by using spinal analgesia, epidural analgesia, local analgesia, nerve block, NSAIDs, COX-2 inhibitors, Gabapentin, Tramadol, etc. (Beswick et al, 2012; Fischer et al, 2008).

Physiotherapy for Pain Management in Total Joint Arthroplasty

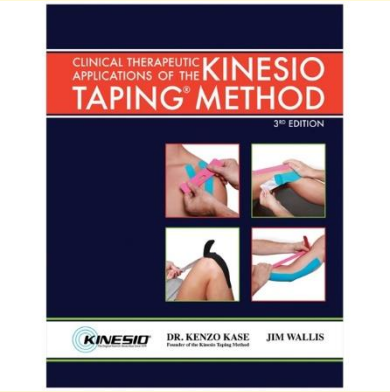
Physiotherapy is an essential element in the rehabilitation pathway in total joint arthroplasty. It plays an important role in not only the rehabilitation in functional activities, but also pain management in the peri-operative journey for cases received total joint arthroplasty. In recent decades, pre-habilitation has been suggested to improve recovery in patients receiving total joint arthroplasty. Studies showed that pre-habilitation reduced pain significantly in patients having total joint replacement at early stage ($\leqq$3 months) (Wang et al, 2016). Early rehabilitation has also been proved to have better outcomes and in local practice, postoperative rehabilitation starts within the same day after surgery. Benefits of starting rehabilitation early not only results in shorter length of stay in hospital, better range of motion, strength and better gait, but also less pain for patients receiving total knee arthroplasty (Labraca et al, 2011).

Physiotherapists make use of various types of physical modalities to reduce pain and to optimize the functional outcomes. Ice therapy is commonly used for pain relief in most of the post-operative physiotherapy program. It reduces the intra-articular temperature and limits pain through reducing nerve conduction velocity, promotes vasoconstriction, reduces vascular spasm and slows down blood flow and hence reduces oedema (Thacoor, Back & Sandiford, 2018). Studies showed that there was significant pain control in patients with ice therapy when compared to epidural anaesthesia after total knee arthroplasty. Continuous cold application resulted in more than 50% reduction in analgesic demand (Thacoor, Back & Sandiford, 2018; Curry et al, 2018; Saito et al, 2004). Continuous cryotherapy was also proved to have significant reduction of pain score in patients after total hip arthroplasty (Saito et al, 2004). Effect of cryotherapy with application of traditional crushed ice packs and continuous cooling icing device was compared. The result showed that the advance cryotherapy conferred no advantages over cheaper and common ice packs (Curry et al, 2018).

Pulsed electromagnetic fields (PEMFs) is a safe and non-invasive treatment that is commonly used in rehabilitation after total joint arthroplasty (Ibrahim et al, 2013). This modality showed agonist activity for A2A and A3 adenosine receptors which could be used to control local inflammatory joints and hence reduce pain after total knee arthroplasty. Previous study showed that PEMFs reduced the pain following total knee arthroplasty significantly (Adravanti et al, 2014).

Transcutaneous electrical nerve stimulation (TENS) is another pain relief modality and can be easily administered by patients and care-givers. According to the gate-control theory of pain, TENS stimulates the ventrolateral periaqueductal gray matter to activate opioid receptors in the rostroventromedial medulla which reduces the activity of nociceptive dorsal horn neurons of the spinal cord resulting is an analgesic effect. Previous reported that TENS could significantly reduce pain and opioid consumption within the first 48 hours after total knee arthroplasty (Li & Song, 2017).

Nowadays,, Kinesio Taping® (KT) is widely used in controlling symptoms such as pain and swelling in musculoskeletal conditions. Application of KT in different manner can achieve various therapeutic effects such as restoration of normal fluid perfusion, removing congestion of lymphatic fluid or haemorrhages, analgesic system activation (elimination of pain cause and activation of pain inhibitors) etc. Effectiveness of KT in reducing postoperative pain after total knee arthroplasty had been investigated and the results showed that less pain was found in patients with KT application from the second week after the total knee arthroplasty till 28th post-operative day (Donec & Krisciumas, 2014).



Conclusion

In conclusion, post-operative pain is major problem that affects the physical outcomes after total joint arthroplasty. Proper multimodal pain management by surgeons, anesthesiologists as well as physiotherapists provide a good quality, effective, efficient and safe rehabilitation pathway for patients receiving total joint arthroplasty.

References

Adravanti P., Nicoletti S., Setti S., Ampollini A., Girolamo L. (2014). Effect of pulsed electromagnetic field therapy in patients undergoing total knee arthroplasty: a randomized controlled trial. *International Orthopedics*, 38:397-403. doi:10.1007/s00264-013-2216-7

Beswick A.D., Wylde V., Gooberman-Hill R., Blom A., Dieppe P. (2012). What proportion of patients report long-term pain after total hip or knee replacement for osteoarthris? A systematic review of prospective studies in unselected patient. *BMJ Open*, 2:e000435. doi:10.1136/bmjopen-2011-000435

Curry A.L., Goehring M.T., Bell J., Jette D.U. (2018). Effect of physical therapy interventions in the acute care setting on function, activity, and participation after total knee arthroplasty: a systematic review. *Journal of Acute Care Physical Therapy*, 9:93-105. doi:10.1097/JAT.0000000000000079

Donec V., Krisciumas A. (2014). The effectiveness of Kinesio Taping^{R} after total knee replacement in early postoperative rehabilitation period. A randomized controlled trial. *Eur J Phys Rehabil Med*, 50:363-71.

Fischer H.B.J., Simanski C.J.P., Sharp C., Bonnet F., Camu F., Neugebauer E.A.M.,…Kehlet H. (2008). A procedure-specific systematic review and consensus recommendations for postoperative analgesia following total knee arthroplasty. *Anaesthesia*,63:1105-1123.

doi:10.1111/j.1365-2044.2008.05565.x

Ibrahim M.S., Alazzawi S., Nizam I., Haddad F.F. (2013). An evidence-based review of enhanced recovery interventions in knee replacement surgery. *Ann R Coll Surg Engl,* 95:386-389. doi:10.1308/003588413X13629960046435

Labraca N.S., Castro-Sanchez A.M., Mataran-Penarrocha G.A., Arroyo-Morales M., Sanchez-Joya M. M., Moreno-Lorenzo C. (2011). Benefits of starting rehabilitation within 24 hours of primary total knee arthroplasty: randomized clinical trial. *Clinical Rehabilitation,* 25:557-566. doi:10.1177/0269215510393759

Li J., Song Y. (2017). Transcutaneous electrical nerve stimulation for postoperative pain control after total knee arthroplasty. *Medicine,* 96:37(e8036).

Parvizi J., Miller A.G., Gandhi K. (2011). Multimodal pain management after total joint arthroplasty. *The Journal of Bone & Joint Surger,*93A:1075-1083. doi:10.2106/JBJS.J.01095

Saito N., Horiuchi H., Kobayashi S., Nawata M., Takaoka K. (2004). Continuous local cooling for pain relief following total hip arthroplasty. *The Journal of Arthroplasty,* 19:334-336. doi:10.1016/j.arth.2003.10.011

Thacoor A., Back D.L., Sandiford N.A. (2018). Cryotherapy following total knee arthroplasty: what is the evidence? *Journal of Rheumatology and Arthritic Disease,* 3:1-4.

Wang L., Lee M., Zhang Z., Moodie J., Cheng D., Martin J. (2016). Does preoperative rehabilitation for patients planning to undergo joint replacement surgery improve outcomes? A systematic review and meta-analysis of randomized controlled trials. *BMJ Open,* 6:e009857. doi:10.1136/bmjopen-2105-009857