

Efficacy and Safety of Intra-Articular Injection of Corticosteroids in Total Knee Arthroplasty

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Abstract

Although total knee arthroplasty is a very successful operation, it comes with severe pain encountered during the post-operative period which may lead to limitation of the knee motion, although nausea and vomiting after surgery was a big concern, steroid injection perioperatively was introduced as a solution for most of these problems which was proven to be effective but should be taken with caution as regards its possible devastating complications.

Keywords Corticosteroid; Intra-articular; Knee arthroplasty; Safety

Introduction

Total Knee Arthroplasty (TKA) is known to be associated with considerable pain postoperatively [1]. A variety of modes of perioperative analgesia have been adopted for patients undergoing TKA including epidural analgesia, femoral nerve block, continuous infusion of opioids into the knee and patient-controlled analgesia, although all of these modalities have proved to be beneficial, but adverse effects have been reported, therefore providing analgesia locally in the area of surgical trauma, with minimal systemic side effects, is an attractive option [2]. In the past few years, the multimodal approach in the control of postoperative pain has been expanded to include peri-articular injections of a corticosteroid derivative to minimize postoperative inflammation and subsequently postoperative pain [3-5]. The anti-inflammatory effect of corticosteroid comes from its inhibition of phospholipase A2, resulting in a reduction of the pro-inflammatory derivatives of arachidonic acid [6]. Injection of corticosteroid into the surrounding tissues can thus provide effective pain relief by reducing the inflammatory response at the sites of the surgical trauma [7]. In the meanwhile, many surgeons are concerned about increasing the risk of postoperative complications such as infection, impaired wound healing, gastric ulcers and tendon rupture [8].

Efficacy of Corticosteroid Injection

The effectiveness of steroid injection in TKA has been tested in regard to postoperative pain relief, narcotic consumption, hospital stay and functional recovery, Sean et al. concluded that injection of triamcinolone acetonide decreased demands for parenteral morphine postoperatively at 18 hours, 24 hours and 36 hours moreover, patients who received periarticular steroid had better range of motion, and this was statistically significant not only from the second day, but also at one, three and six months in comparison to the control group [9]. Ikeuchi et al. achieved similar results regarding pain VAS and fentanyl consumption using dexamethasone, they asked patients to rate pain by placing a mark on a 100 mm line with two endpoints representing 'no

pain' and 'worst pain imaginable'. The distance along this line from the 'no pain' marker was then measured with a ruler giving a pain score out of 100, the average score in steroid group was lower than control group and it showed significant difference at Post-Operative Day (POD) one (14 ± 13 vs. 43 ± 18 mm; $p=0.0001$) and (POD) three (27 ± 16 vs. 43 ± 18 mm; $p=0.0048$), they also demonstrated that inflammatory markers such as CRP in serum and IL-6 in drainage fluid are significantly lower in the steroid group owing to the potent anti-inflammatory effect of corticosteroids [10]. In a study by Kwon et al. examining the effect of Peri-articular Injection (PI) of steroid in patients undergoing bilateral staged TKA where they randomized patients to receive PI steroid or non, with 3 months separating the procedures. They found that the pain level was significantly lower in the PI steroid than the non-steroid group on the night of the operation (VAS, 1.2 vs. 2.3; $p=0.021$). Another benefit of dexamethasone is the antiemetic effect, that is why in one study more patients in the control group (not having corticosteroids) complained of nausea and vomiting than the steroid group, although the differences were not statistically significant [11].

On the other hand, one study revealed that methylprednisolone acetate injection had a significant effect ($p=0.01$) only on the length of hospital stay with statistically insignificant effect on pain scores, narcotic use or functional knee scores [12]. These results show some degree of conflict probably attributed to different types of corticosteroids used.

Safety of Corticosteroid Injection

There has been a controversy in the literature regarding the risk of septic arthritis in patients injected with intra-articular corticosteroids. Despite low overall infection rates, some authors concluded that the use of such injections was strongly associated with the development of septic arthritis [13,14]. In contrast, other researchers have reported a very low risk of infection following corticosteroid injection. Gray and Gottlieb administered corticosteroid injections without using sterile gloves or masks, one infection was identified after 14,000 to 50,000 injections, with infection rates ranging from 0.002% to 0.007% [15]. In another study by Fitzgerald, 3000 steroid injections were administered

per year, there were no cases of septic arthritis when rigid aseptic precautions had been used [16]. In a more recent study conducted by Christensen et al., corticosteroids were injected intra-operatively in the periarticular ligamentous attachments, synovium, posterior aspect of the capsule, and arthrotomy sites prior to capsular closure, the results showed that three patients in the steroid group had complications where one patient died twenty-five days after the surgery as a result of complications associated with deep knee joint sepsis, however, the rate of complications wasn't statistically significant ($p=0.24$) from the non-steroid group [12]. Other studies reported no complications at all [13-16].

Conclusion

Although we believe that steroid use with total knee arthroplasty has some benefits regarding better pain scores, less hospital stay and to some extent better range of motion, but great precaution should be taken when using steroid to avoid any devastating complications.

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