Review Article

Contribution of Epidural Injections in the Management of Radiculopathy by Lumbar Disc Herniation: A Narrative Review

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Abstract

Epidural injections considered to be the mostly performed nonsurgical treatment for radicular pain due to Lumbar disc herniation. Different types of epidural injections have been used in the management of lumbar radiculopathy including local anesthetics only, different types of steroids, and combined steroids and local anesthetics using different approaches.The objective of this review to examine the effectiveness of epidural injections in the management of sciatica. High quality evidence with different study design will be discussed including Systematic reviews, Randomised Control trials (RCTs) and retrospective studies. Different types of epidural injections have been studied in the management of lumbar radiculopathy including local anaesthetics only, different types of steroids, and combined steroids and local anaesthetics using different approaches. Studies have been conducted in order to assess the superiority of one type on the other in term of pain relief, functional improvement, and reduce the surgical intervention.The literature has shown that epidural injections are effective treatment for LDH in term of both pain relief and functional improvement regardless of the type of injections whether steroids with local anaesthetics or local anaesthetics alone. There is strong evidence showing that epidural injections are more effective in the short term (< 6 months) than the long term (> 6 months).

Keyword: low back pain, sciatica, lumbar disc prolapse, lumber disc herniation, leg pain, management, Epidural injections, complications, routes of epidural injections, timing of epidural injections.

Introduction

Lumbar radiculopathy, lumbosacral radicular syndrome, and nerve root irritation or nerve root entrapment are all interchangeable terms that have been used in literature to refer to sciatica. [1,2] Sciatica has been characterized as a debilitating symptom rather than a specific diagnosis [1]. The clinical presentation varies because it depends on the level of the nerve roots involved. However, L5/S1 counts for being the most common radiculopathy [3]. This usually presents with low back pain radiating unilaterally down to the lateral aspect of the leg and foot, weakness, numbness, and tingling sensation, which follow the dermatomal distribution of the affected nerve. [2,4] The causes of sciatica vary from Lumbar disc herniation (LDH), lumbar canal or foraminal stenosis, or inflammatory process around the nerve root. [5] It has been reported that the estimates of sciatica or lumbar

radiculopathy is about 9.8 per 1000 cases, of which there 5.1% in men and 3.7% in women [6]. The cases of sciatica in general population have been reported as 1-2%, of which LDH was reported to occur in 90% [7]. There is a general agreement made in the literature about sciatica treatment. Sciatica due LDH is a self-limiting condition that will improve within weeks to months without any medical intervention [8]. NICE guidelines recommended the administration of epidural injections of local anaesthesia and steroids to manage patients' over 16 years old with acute to sever sciatica. Epidural injections considered to be the mostly performed nonsurgical treatment for radicular pain due to LDH [9-10]. Different types of epidural injections have been used in the management of lumbar radiculopathy including local anaesthetics only, different types of steroids, and combined steroids and local anaesthetics using different approaches [10].

Search strategy

Database searched include Web of Science, PubMed, CINAHL, Cochrane library. Key words used: low back pain, sciatica, lumbar disc prolapse, lumber disc herniation, leg pain, management, Epidural injections, complications, routes of epidural injections, timing of epidural injections. The literature review used in this assignment will focus on the use of epidural injections in the management of sciatica. High quality evidence with different study design will be discussed including Systematic reviews, Randomised Control trials (RCTs) and retrospective studies. The search will be limited to the most recent studies with high quality evidence, mostly the studies that have been published within the last 10 years, and in English language. The themes of literature review will be discussed include Types of epidural injections, Efficacy of epidural injections, Routes of administration and complications of epidural injections.

Types of epidural injections

Different types of epidural injections have been used in the management of lumbar radiculopathy including local anaesthetics only, different types of steroids, and combined steroids and local anaesthetics using different approaches [11]. Studies have been conducted in order to assess the superiority of one type on the other in term of pain relief, functional improvement, and reduce the surgical intervention.

A. Steroid injections

Kennedy DJ et al in multicentre prospective double-blinded RCT has been conducted to evaluate the effectiveness of particulate and non-particulate corticosteroids in managing radicular pain due to lumbar disc herniation [12]. 78 participants with single level acute disc herniation and unilateral radicular pain were randomized into two groups to either receive a dexamethasone or triamcinolone epidural injections using transforaminal approach. The effectiveness of the two types of steroids injections was assessed by comparing the number of injections received in each group, the surgical rates, and pain score at 2 weeks, 3 months and 6 months. The study has concluded that there was a statistical significant improvement in pain and function at 2 weeks, 3 months and 6 months for both groups with no difference between the two groups. However, dexamethasone group has received more injections compared to triamcinolone group, with 17.1% to 2.7% receiving three injections respectively. In contrast there was no statistical significant difference in surgical rates for both groups despite it was higher in the triamcinolone group. The conclusion made in this study follow

the existing literature with no statistical difference between the use of dexamethasone and triamcinolone in term of pain relief, functional improvement, and surgery rates. Park et al study was the only study that showed a statistically significant difference between the groups who used dexamethasone and triamcinolone in favour to triamcinolone [13] compared to Kennedy et al study. Despite the fact that Park et al study has more participants of 106, however, Park et al follow up period was only for one month, while Kennedy et al follow up of 3-6 months. The longer follow up period may have result in disappear of differences between the two study groups. The limitations of Kennedy et al as follow. Firstly, the study was terminated before it reached the planned target because of the addition of "Not for Epidural use" statement to the trimcinolone's labels. Secondly the use of highly selective group of subjects and did not state whether the number of participants was the same at the start and at the end of the study or not. Therefore, the results of this study cannot be generalized to the population of interest because the study did not reach the planned target. In conclusion, most literature has reported that there is significant improvement in pain relief and function with the use of either dexamethasone or triamcinolone. However, there was no statistical difference in superiority between the use of dexamethasone and triamcinolone in term of pain relief, functional improvement, and surgery rates.

B. Steroid VS Local anaesthesia

According to the current available literature, the mechanism of action of epidural administered steroids or local anaesthetics injections in the management of chronic low back pain still unknown [14-18]. Moreover, current evidence suggests a comparable effect between steroids and local anaesthetics in the management of facet joint pain and low back pain without lumbar disc herniation [19]. This topic is of a particular importance to our case mentioned above as the type of epidural injection has to be highlighted to the patient and need to answer the questions asked by the patient. Zhai et al., systematic review and meta-analysis of ten RCTs has been conducted to compare the effectiveness epidural injections of local anaesthetics alone to local anaesthetics with steroids using all the important outcomes measures in term of pain relief, functional improvement, opioid intake, and therapeutic procedural characteristics [20]. The overall conclusion stated that the use of local anaesthetics alone and the use of combined local anaesthetics plus steroids have significant improvements in all measured outcomes for both groups. However, the results showed no statistical significant difference between the two groups. The study asked a clear focused question using a well-defined population of interest; intervention given; and the outcome considered. The authors used a wide range of databases and included only RCTs with no language restrictions. All these contribute to support the validity of the paper, clearly explain the inclusion and exclusion criteria and help in producing clear results. The results of similar studies have been combined, the results of included studies have been clearly displayed, and the reason of any variations in the results has been discussed. These in turn demonstrate that all the important and relevant studies have been included and all the results have been explained in a reasonable way. The bottom line results were, there was a significant improvement in both groups term of pain relief, functional assessment, opioid intake, and therapeutic procedural characteristics. However, no significant difference between the two groups in the outcome measures mentioned above. The

clearly explained results and the clearly defined population demonstrate that the results can be applied to the local population as both the local population and the local setting is similar to the ones used in the study. The conclusion reached by Zhai et al. [20] can be applied to local population because of the inclusion of high quality RCTs involving 1111 patients in the meta-analysis. The big sample size has reduced the over estimation of treatment effect and enhanced the statistical power to detect the effect of local anaesthesia with or without steroids. Furthermore, Zhai et al. [20] study conducted Begg's and Egger's test to assess the publication bias which showed no evidence of potential publication bias in the selected RCTs. However, the study showed some possible limitations. Firstly, the estimated treatment effect may have been affected by the uncontrolled confounding like gender, weight, and onset. Secondly, there was a considerable degree of heterogeneity in the included studies. These may affect in interpretation of the results. Overall, this is a clear, well-conducted study, clearly defined big population size, with clearly explained results. The conclusion drawn is applicable to general population. It reported that currently, there is a lack of evidence to support the superiority of local anaesthesia with steroid to local anaesthesia alone in the management of lower extremity pain and low back pain.

Routes of administration of epidural injections

Multiple routes have been used to administer epidural injections into the epidural space, namely interlaminar, caudal, and transformational [21]. The literature has described the difference between these three approaches. It has been reported that the interlaminar entry delivers the medication close to the site of pathology; transforaminal approach is considered as a target-specific entry that requires the smallest volume to reach the primary site of pathology [16,22]. However caudal entry is considered to be the easiest, safest with low risk of inadvertent Dural puncture, even though requiring high volume of medication [14]. Multiple studies have been conducted to compare between these different approaches in order to introduce the most effective approach with best clinical outcome with less complications. Manchikanti et al., [23] a recent manuscript analysis study published in the Korean Journal of pain in January 2015 conducted to compare all the three approaches and to check whether one approach is superior to the other in managing lumbar disc herniation. The study analysed the data from three good quality randomized controlled trails that assessed a total of 360 patients with lumbar disc herniation. Each trail has assessed the effectiveness of a single approach in the treatment of lumbar disc herniation, with 120 patients per trail receiving either local anaesthetic alone (60 patients) or local anaesthetic with steroids (60 patients) [23]. The study concluded that there is significant improvement in patients suffering from chronic LDH with similar efficacy of all 3 lumbar epidural approaches with the use of local anaesthesia alone or local anaesthesia with steroids. The study has justified the conclusion due the fact that the three RCTs that have been used in this comparison are of high quality, well conducted, large number of patients (120 per trail), and long-time follow up of two years. These results in the conclusion drawn can be applied to the local population. The RCTs used were double blinded, randomization was performed using computer generated random allocations sequence, clear inclusion and

exclusion criteria, clear objectives. The sequence concealment was performed by the operating room nurse assisting with the procedure randomize the patients and prepare the appropriate drugs. All these contribute to decrease the degree of selection bias that in turn results in a more applicable conclusion and reduce the degree of confounding error. The trails used in this assessment have been utilized to meet the essential criteria for practical clinical trials that measure the effectiveness rather than the efficacy. This has been considered to be more applicable in clinical practice and resulting in practical applications and implications for providers of pain management interventions. The evaluation of these trials was performed with a clear proper methodology that has been conducted in a practical setting. This in turn provides the appropriate information and facilitates a genuine intervention to reduce patient's pain, reduce drug use, improve function, and potentially return the patient to work as soon as possible. On the other hand, the use of three separate RCTs that have been conducted separately rather than as on trial can be considered a deficiency. In addition to that there was no placebo group in any of the trails. However the use of a placebo design may lead into improper conclusions and injection of inactive substance in an active structure may result in various clinical effects.

Efficacy of epidural injections

The effectiveness of epidural injections was measured in the literature by different articles using two main outcomes measures namely the pain relief and functional improvement [23]. Pain relief was defined as "at least 50% improvement in pain or 3-point improvement in pain scores in at least 50% of the patients" [23]. The functional improvement was defined as "50% reduction in disability or 30% reduction in the disability scores" [23]. Authors have reached into different conclusion regarding the level of evidence for the efficacy of epidural injections [23]. Some authors have concluded that epidural injections were not effective and lack the medical necessity in managing pain and improve function in patient with herniated disc and radiculopathy [24-28]. On the other hand, other authors conducted multiple trails to challenge the conclusion drawn against the effectiveness of epidural injections. These trial showed a significant improvement in pain and function with the use of epidural injections [29-38]. It was hard to come up with a solid conclusion in favour or against the effectiveness of epidural injections in relieving the pain and improving the function of patients with disc herniation and radiculopathy. This can be due to the fact that some of the published systematic reviews and trial shown some flaws in combing trial of different design, improper assessment of trials, and the use of active controlled trial as a placebo control which failed to provide an estimate of treatment effect. As results of this disagreement between different studies, a recent systematic review has been done in 2015 in order to determine the short term and long term effect of epidural injections in treating disc herniation [23]. The review has concluded there was available evidence that showing, in well selected patients with lumbar disc herniation, the fluoroscopically performed epidural injections by trained physicians offer a pain and function improvement. The evidence was stronger for short-term effect compared term long-term effect [23]. The review has focused on the clinical aspect with a proper methodological quality assessment. Outcome measures defined as pain relief and functional improvement, and have been considered at 3 months, 6 months and 12

months. Short term was defined as less than 6 months and long term as more than 6 months. The inclusion and exclusion criteria were clear. Also, it has been explained in words, figures, tables and diagrams. Only focused on published, English language only, high quality RCTs, and Cochrane review tool has been used to define the quality of RCTs chosen. The results have been combined qualitatively but not quantitatively. All these contribute in making the results more applicable to the general population. The weakness points of this study can be summarized as no meta-analysis has been conducted due to lack of homogeneity in the included RCTs. Limitations of availability of high quality studies to be included despite 23 trials met the inclusion criteria for the three modes of administration. Furthermore, most of the evidence for long-term effect has been obtained from active-controlled trial. Therefore, future RCTs design should focus on long-term follow up and more applicable outcomes that are more likely to be included in meta-analysis.

Corticosteroids complications

Pontos et al., [39] a systematic review conducted to assess the safety of corticosteroids injections. They have concluded that the true incidence of the complications still unclear, the vast majority of complications result from intra-arterial administration and due to vascular injury. At the same time the use of non-particulate corticosteroids, live fluoroscopy, digital subtraction angiography, accurate placement of the needle, and familiarisation of the operator with contrast on fluoroscopy could minimize these complications. Furthermore, they have heighted the fact the current available data lack the complete documentation, showed unreported data, and inherited bias.

The study has a clear focused question with a defined population of interest. Also, the inclusion and exclusion criteria have been explained clearly. These in turn support the validity of the results.

Several limitations can be highlighted in this study. Large proportion of the used literature provided insufficient documentation that includes the approach used, symptoms duration, and number of injections. Furthermore, majority of the literature used reported the adverse effects incidentally because the main aim focus of most of the studies was to report the efficacy of the injections. These made it difficult in applying the results on the general population.

In summary, the complications of epidural injections can probably be reduced or avoided by using fluoroscopic guidance, contrast enhancement to avoid vascular uptake, use of non-particulate corticosteroid, and dose test of local anaesthic before injection of corticosteroid.

Conclusion

Overall, the literature has shown that epidural injections are effective treatment for LDH in term of both pain relief and functional improvement regardless of the type of injections whether steroids with local anaesthetics or local anaesthetics alone. There is strong evidence showing that epidural injections are more effective in the short term (< 6 months) than the long term (> 6 months). Furthermore, all three routes of administration have shown to be effective with no superiority of one route on the other. Epidural injections can lead to some complications however these can be avoided using appropriate technique.

Conflict of interest

None

References

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