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Comparison of Pain Score Reduction Using Triamcinolone Vs. Betamethasone in Transforaminal Epidural Steroid Injections for Lumbosacral Radicular Pain

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Abstract

Background: Results from studies on individuals with radicular pain and radiculopathy have demonstrated that lumbar transforaminal epidural steroid injections (TFESIs) can alleviate pain and improve physical functionality. In certain cases, TFESIs are cost-effective, and research has shown that they have a surgical sparing effect.

Aim: To compare the reduction of pain scores when TFESIs are administered for lumbosacral radicular pain, utilizing triamcinolone or betamethasone.

Materials and methods: This meta-analysis was performed on 3 trails, including a total of 4271 patients, according to the guidelines by the Cochrane Collaboration. All studies adhered to the PRISMA guidelines for systematic reviews and meta-analyses whenever possible.

Results: The publication year ranged from 2009 to 2015. 2 studies were conducted in USA; 1 study was conducted in Turky. There are two study results that can be utilized (Follow up VAS). A significant amount of variation was found. So, the analysis was conducted utilizing a random-effect model (I^2 = 99%, P<0.00001). Along with the 95% CIs, the combined mean difference was -0.93 (-1.20 to -0.66). There is a statistically significant distinction among the groups when it comes to the Follow up VAS (Z = 6.70, P <0.00001), consistent with the combined result.

Conclusion: In a short-term follow-up, individuals who had triamcinolone by transforaminal epidural steroid injection rather than betamethasone reported more frequent pain alleviation. In order to establish that triamcinolone is superior to betamethasone in treating lumbosacral radicular pain, more research is required.

Key words: Pain score, triamcinolone, betamethasone, lumbosacral radicular pain

Introduction

Results from studies on individuals with radicular pain and radiculopathy have demonstrated that lumbar TFESIs can alleviate pain and improve physical functionality. In certain cases, TFESIs are cost-effective, and research has shown that they have a surgical sparing effect **(1)**.

Particulate steroids such as triamcinolone, methylprednisolone, or betamethasone have traditionally been utilized as a corticosteroid preparation in these treatments. The most compelling evidence for the effectiveness of TFESIs comes from an experimental study that utilized triamcinolone as the steroid preparation **(2)**.

Spinal cord infarctions resulting in paralysis have been documented as serious consequences during lumbar TFESI. Thirteen case reports have documented acute paraplegia resulting from spinal cord infarction following lumbar TFESIs at levels that vary from L1 to S1 **(3)**.

Each of these side effects has originated from the use of particulate steroids. These devastating consequences are thought to be caused by the embolization of a medullary artery, also known as the artery of Adamkiewicz. This occlusion cuts off blood flow to the lower thoracic cord and the conus medullaris **(4)**.

Research by Derby et al., **(5)** & Benzon et al., **(6)** have revealed that methylprednisolone, betamethasone, as well triamcinolone as are all capable of forming embolic material at the arteriolar level, either in the form of particles or aggregates. On the other hand, dexamethasone is not an embolic agent since it does not contain particles larger than a red blood cell. Many centers are utilizing dexamethasone as the corticosteroid of preference for TFESIs; no catastrophic complications have been reported.

Although the superior safety profile of dexamethasone in TFESIs is acknowledged, there are ongoing concerns over its effectiveness in contrast to particulate corticosteroids. The pragmatic studies of Dreyfuss et al., **(7)** and Lee et al., **(8)** indicated a nonsignificant tendency for enhanced effectiveness in cervical TFESIs utilizing triamcinolone in contrast to dexamethasone.

Participants were those with axial low back pain together with or without radicular discomfort, and the efficacy of triamcinolone compared to betamethasone when administered epidurally Stanczak et al.,**(9).** The effectiveness of epidural steroid injection as a treatment for axial low back pain without radicular symptoms has been the subject of inconsistent research**(10), (11)**. Blankenbaker et al., **(12)** evaluated the effectiveness of triamcinolone vs betamethasone in treating lumbar radicular pain. Triamcinolone and betamethasone were therefore compared in this meta-analysis for the lowering of pain scores in TFESIs for lumbosacral radicular pain.

The objective of this meta-analysis was to compare the reduction of pain scores resulting from TFESIs for lumbosacral radicular pain by triamcinolone as well as betamethasone.

Materials and methods

In accordance with the recommendations provided by the Cochrane Collaboration, this meta-analysis was carried out on three studies, that involved a total of 4271 cases. The PRISMA statement, which stands for Preferred Reporting Items for Systematic Reviews and Meta-analyses, was considered during the reporting process.

Search strategy

The research aimed to examine the connection among pain score, triamcinolone, betamethasone, TFESIs, as well as lumbosacral radicular pain by searching electronic sources such as PubMed, Web of Science, as well as the Cochrane library. The search results' titles and abstracts were each reviewed separately by two reviewers. The inclusion criteria were assessed against the resulting studies after the removal of duplicate articles. The full texts of all studies that were potentially relevant were obtained for evaluation against the specified inclusion criteria. The results were synthesized only after the studies that met the criteria were further evaluated. The reference list of the articles that were included was evaluated to determine whether any studies met the inclusion criteria.

Eligibility criteria:

Inclusion criteria: Research involving community-dwelling individuals of either sex who were 18 years or older and who reported lumbosacral radicular pain in the lower limb, along

with or without low back pain, was considered. The pain was defined as moderate-to-severe, with a rating of 4 on a 0 to 10 numerical rating scale (NRS).

Exclusion criteria: involved case reports, chapter abstracts, nonsystematic reviews, and reports lacking adequate diagnosis.

Risk of bias assessment

The Cochrane Risk of Bias assessment tool 1 (ROB 1), which has been developed particularly for interventional research, has been utilized to evaluate the quality of the trial. Detection bias, attrition bias, performance bias, reporting bias, Selection biasand prospective sources of bias are all included in this evaluation instrument. The level of bias in each trial was analyzed, and the researchers classified it as "high," "low," or "unclear" for each parameter under consideration.

Statistical analysis

All of the data analysis was carried out with Review Manager version 5.4.1 that was utilized. 2014 publication by The Cochrane Collaboration, published by the Nordic Cochrane Centre in Copenhagen. We determined the probability ratio for binary outcomes together with the 95% CI. We determined the mean difference with a 95% CI for continuous outcomes. We utilized a fixed-effect model with the Mantel-Haenszel technique to determine the overall impact, estimate with 95% CI, in cases when there is no indication of research heterogeneity. The alternative was to use a random-effects model based on the DerSiomonian and Laird technique. The studies' heterogeneity was assessed by calculating the proportion of variability in the effect estimates utilizing the Q statistic and the I^2 test. P values below 0.05 were significant.

Results

A total of 3 studies were selected for the current analysis, including a total of 4271 cases. The publication year ranged from 2009 to 2015. 2 studies were conducted in USA; 1 study was conducted in Turky. Table 1 displays the baseline characteristics of the studies that were considered.

Author, year	year	country	Study period		Study design	Sample Size		
			from	to		Triamcinolone	Betamethasone	total
Zachary L Mccormick,(13)	2015	USA	2006	2007	Cohort study	776	263	1039
Christine El-Yahchouch, (14)	2013	USA	2006	2011	Cohort study	1151	2011	3162
Lutfiye Pirbudak Cocelli, (15)	2009	Turky			comparative study	30	40	70

Table 2. Patient's characteristics

Table 2 illustrates that the mean age of participants in the investigated categories was 57.6, with a range of 25 to 79 years.

Author, year	Age (year)					
	Triamcinolone			Betamethasone		
	mean	SD	total	mean	SD	total
Zachary L Mccormick, (13)	53.2	15.5	776	54.4	17.1	263
Christine El-Yahchouch, (14)	60.5	16.3	1151	63.3	15.8	2011
Lutfiye Pirbudak Cocelli, (15)	50.2	18.3	30	49	12.8	40

VAS baseline:

Two investigations were reported (Baseline VAS), and all are applicable. There was a non-significant heterogeneity evident. In order to conduct the analysis, a random-effect model was implemented (I^2 = 0%, P=0.35). -0.10 (-0.31 to 0.11) was the combined mean difference and 95% CI. The combined outcome indicates that there is no significant distinction among the groups regarding the baseline VAS. (P=0.34, Z = 0.96).

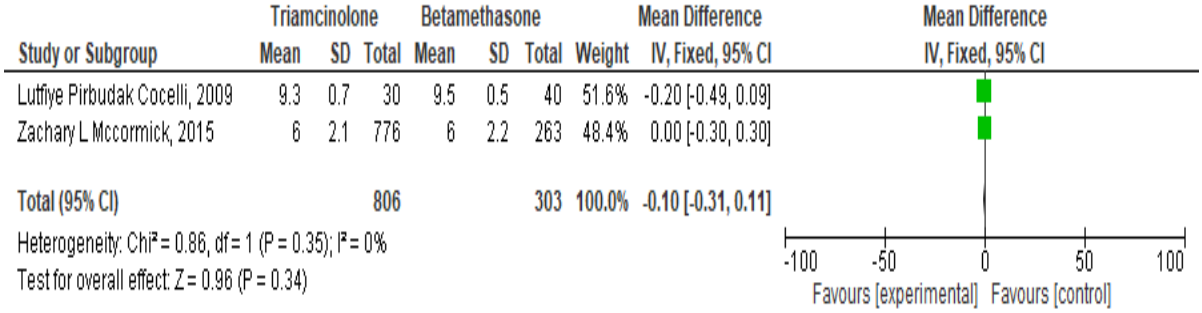

Figure 1. Forest plot of baseline VAS demonstrates no significant variation among Triamcinolone & Betamethasone groups.

VAS follow up:

Both of the stated studies (Follow up VAS) are applicable. There was found to be a significant amount of variation. Hence, as I^2 = 99% and P<0.00001, a random-effect model was utilized for the research. With the inclusion of 95% CIs, the overall mean difference was -0.93 (-1.20 to -0.66). The combined result indicates a significant distinction among the groups in terms of the follow-up VAS (Z = 6.70, P <0.00001).

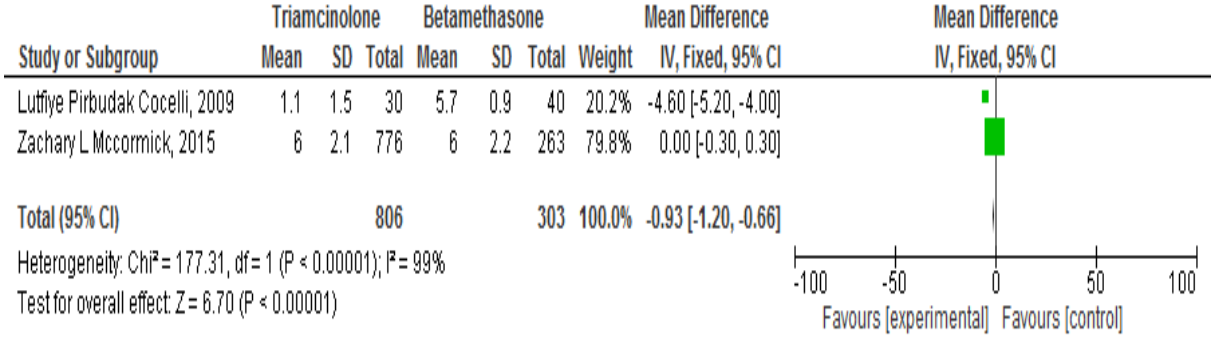

Figure 2. Forest plot of follow up VAS reveals significant variance among Triamcinolone and Betamethasone groups.

NARS baseline:

one study reported (Baseline NARS) and all can be used. There was a 0.00 (95% CI, -0.16 to 0.16) total mean difference. There was no significant distinction among the groups concerning the baseline neuropsychiatric rating scale (Z = 0.00, P = 1.00) when all parameters were included.

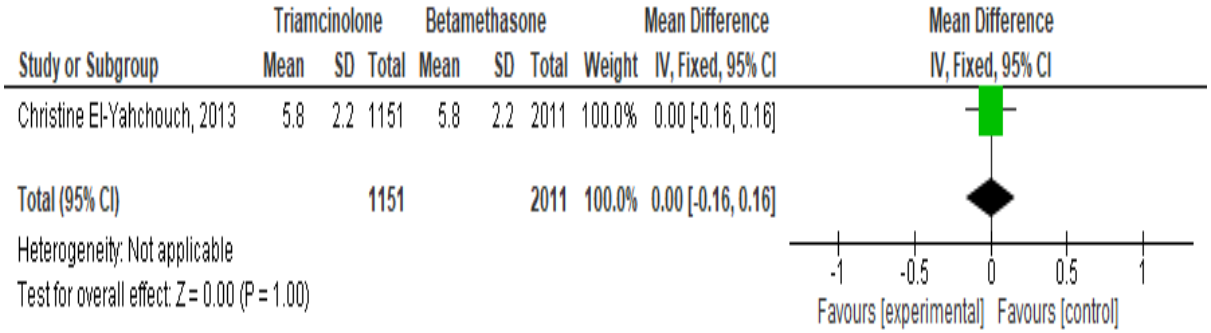

Figure 3. Forest plot of baseline NARS indicates no significant variance among Triamcinolone and Betamethasone groups.

NARS follow-up:

one study reported (follow-up NARS) and all can be used. The combined mean difference and 95% CIs was -010 (-0.29 to 0.09). The combined result demonstrates no significant variance among groups concerning (follow-up NARS) (Z = 1.03, P =0.30).

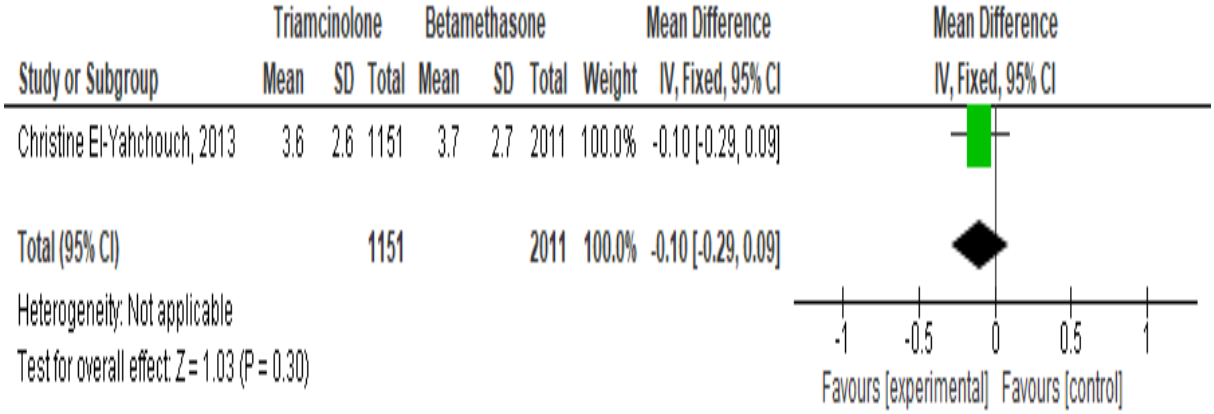

Figure 4. Forest plot of follow-up NARS illustrates no significant variance amongst Triamcinolone and Betamethasone groups.

Discussion

This meta-analysis demonstrated that there was no statistically significant variation amongst groups concerning (Baseline VAS). A statistically significant distinction was observed among the Triamcinolone as well as Betamethasone groups during the follow-up VAS. There was no significant distinction among the groups with regard to Baseline NARS and follow-up NARS, as evidenced by the combined result.

The efficacy of transforaminal epidural steroid injection with either triamcinolone or betamethasone, two particulate corticosteroids, in alleviating lumbosacral radicular pain was investigated by **McCormick et al., (13)** in the year 2015. A significantly higher proportion of cases treated with triamcinolone compared to those receiving betamethasone achieved a pain reduction above 50 percent, as evidenced by nonoverlapping 95 percent CI. This was further substantiated by the observation that triamcinolone exhibited a much greater reduction in pain compared to betamethasone throughout the short-term follow-up (P=0.001), but the mean differences did not attain a clinically minimum detectable variance.

El-Yahchouchi et al., (14) conducted a meta-analysis in which they used individuals suffering from lumbar radicular pain and either radiculopathy or no radiculopathy at all to determine if the nonparticulate steroid dexamethasone was noninferior to the particulate steroid formulations triamcinolone or betamethasone. Dexamethasone had comparable efficacy to particulate steroids in pain relief and functional enhancement over a two-month period, as

indicated by the categorical findings. Dexamethasone demonstrated superior pain relief and functional enhancement at 2 months compared to particulate steroids, based on continuous data. There was no evidence to indicate that dexamethasone was less efficacious than particulate steroids in lumbar TFESIs that were conducted for the purpose of treating radicular pain, regardless of whether or not radiculopathy was present.

At the 14-day short-term follow-up, **Blankenbaker et al., (12)**compared the efficacy of two particulate corticosteroids in treating lumbosacral radicular pain with TFESI. Betamethasone and triamcinolone were compared for their ability to reduce pain in 114 participants. The mean age of their research sample was 60 years, which is older than the 54-year-old group in this study. At the 14-day follow-up, there was no significant difference in pain reduction between the groups given betamethasone and triamcinolone. The discrepancy between this study's results and those of **Blankenbaker et al., (12)** could be because the latter's research lacked the ability to detect smaller-scale significant differences. They also couldn't draw any firm conclusions because they didn't use a categorical analysis. The contrast of group means to analyze pain as a continuous variable, as described in "METHODS," may obscure the significant variation in the frequency of a clinically significant response among groups. **(16)**.Consequently, a significant decrease in pain may be observed subsequent to TFESI**(16)**.

A comparison of the efficacy of epidural betamethasone injections and triamcinolone injections was carried out by **Cocelli et al., (15)** in the treatment of discal radiculalgia respectively. The findings of the VAS, straight leg elevation test, and the Oswestry Disability Index in both groups revealed considerable improvements throughout the first week of the therapy. During the first, second, and sixth weeks of the study, the values of the VAS scored by group 2 were considerably lower than those scored by group 1. Although there was no significant disparity between the two groups at the final follow-up, they considered that triamcinolone was preferred in an epidural steroid injection (ESI) technique due to its short-term benefits. This was the case despite the fact that there was no distinction between the two groups.

A randomized control experiment as well as correlative imaging was carried out by **Park et al., (17)** , which encompassed 106 individuals who were experiencing lumbar radicular pain. Both 7.5 mg of dexamethasone and 40 mg of triamcinolone were administered to the patients using TFESI. The participants were allocated to receive either of these medications at random. VAS scores and the McGill pain questionnaire were utilized to evaluate pain one month after injection, while the Oswestry disability index was used to quantify functional improvement. The McGill pain questionnaire did not support the finding that triamcinolone considerably alleviated pain evaluated by VAS more than dexamethasone when using mean values of continuous data. There was no difference between the two agents, and neither one improved functionality statistically. There was no significant distinction among triamcinolone and dexamethasone in terms of the percentage of participants who achieved a fifty percent VAS decrease when using categorical data.

Conclusion

Based on the findings of this meta-analysis, it was shown that patients who had TFESIs with triamcinolone reported more frequent short-term pain relief than those who were treated with betamethasone. For the purpose of determining whether or whether triamcinolone is more successful than betamethasone in the treatment of lumbosacral radicular pain, further study is necessary.

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