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ORTHOPAEDIC OUTCOME ASSESSMENT

Evaluation of responsiveness of Oswestry low back pain disability index

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Abstract
Aim To assess the response of Oswestry disability index (ODI) among patients undergoing caudal epidural steroid injections for lumbosacral radicular pain.
Methods A total number of 107 consecutive patients were analysed. ODI was obtained at preassessment and then at 6 weeks post-injection. At follow-up, patients were asked to rate their condition on an ordinal scale as compared to pre-injection based on their response to five questions (much better, better, same, worse, much worse). As a measure of responsiveness, the effect size and standardized response mean (SRM) was calculated.
Results The mean age of the cohort was 58 years. The mean duration of symptoms was 11 months. The mean Pre-injection ODI for 107 patients was 49(95% CI 46–52). The mean post-injection ODI at 6 weeks was 32(95% CI 28–35). The mean change in ODI was 16.9(95% CI 14–19). The mean change in ODI for much better or much worse group was 21.98(95% CI 18–25). The mean change in ODI for better or worse group was 15(95% CI 10–19) (P = 0.01). The mean change in ODI for same group was −0.6(95% CI −10 to 11). The effect size for the whole group was 1.05. The responsiveness as measured by SRM for the whole group was 0.84.
Conclusion This study shows that ODI can detect small changes in disability over time in patients undergoing caudal epidural injections for lumbosacral radicular pain. It can also differentiate between small and large changes in the level of disability.

Keywords Oswestry disability index responsiveness

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Introduction

The evaluation of disability caused by low back pain has become an important issue in recent times. The Oswestry diability index (ODI) has been widely used and is claimed to be one of the most effective instruments to measure disability in patients with low back pain [1, 2].

The development of this index (ODI) was initiated by John O'Brien in 1976. The index was first published by Fairbank and Davies [2] in 1980 and since several other studies have been published establishing reliability and validity of this index [3]. ODI was originally written and validated in English but later it has been translated and validated into several languages and countries [4, 5]. In order to enhance the use of ODI in prospective studies (such as the assessment of effectiveness of different treatment methods) further studies of the instrument's ability to detect change over time would be helpful for interpretation of score changes and for sample size calculations. Efforts have been made in the past to describe different aspects of an instrument's ability to measure change, particularly studying changes over time, for groups or individuals and comparing groups with each other. The ability of a score to change with time following an intervention is called responsiveness. We think that to facilitate research, the instrument's ability to detect changes over time including minor changes in responsiveness as perceived by the patient are needed. The responsiveness of a score is part of a validity assessment.

Very few studies have been done previously considering the responsiveness of ODI in a variety of spinal disorders or of its comparative change following caudal epidural steroid injections for different spinal pathologies.

The main aim of this study was to assess the response of ODI among patients undergoing caudal epidural steroid injections for lumbosacral radicular pain due to various spinal pathologies. The secondary aim was to quantify self-rated effectiveness of the treatment when using ODI.

Materials and methods

The ODI [6]:

- It is self-administered, being filled in by patient themselves.
- It consists of ten sections.
- Each section has six statements, each representing an increasing level of disability than the preceding statement.
- The patient marks one of the statements in each section best representing his or her condition.
- Each section is scored on a scale of 0–5 (0 representing no disability and 5 as the greatest disability).
- The scores for all sections are added together giving a possible score out of maximum 50. This total is then doubled and expressed as a percentage disability.
- The interpretation of disability is related to percentage interval with 0–20%. indicating minimal disability to 81–100% representing bed ridden patients, i.e. maximum disability

All patients undergoing caudal epidural steroid injections for lumbosacral radicular pain between October 2005 and April 2006 were included in the study. All these patients had their symptoms persisting for more than 4 weeks unrelieved by analgesia and physiotherapy. They were asked to fill in version 2.0 of ODI [6] at preassessment (1–2 weeks before the procedure) and then at first follow up 6 weeks post-injection. A total of 107 consecutive patients were included in the study. Sixty-three patients (59%) had spinal stenosis, 39(36%) had intervertebral disc prolapse and 5(5%) had degenerative spondylolisthesis. At the time of the follow-up visits, patients were also asked to rate their condition on an ordinal scale, post-injection as compared to preinjection based on their response to five questions (much better, better, same, worse, much worse). All patients were assessed in the spinal clinic by the specialist nurse practitioner. For the whole population of patients included in our study, preinjection score, post-injection score at 6 weeks and mean change in score was calculated. As a measure of responsiveness, the effect size and the standardized response mean (SRM) was calculated. The external criteria for change in their disability following injection, the item regarding how the patient rated his status 6 weeks post-injection as compared to pre-injection was used. Because detecting both improvement and worsening reflect the responsiveness, the pre- to post-injection score differences were considered to be in the same direction and the mean change in ODI score and 95% confidence intervals (CI) were calculated for the patients with much better or much worse response and also for the patients with better or worse response. The difference in the mean change scores between these two groups were evaluated using the *t*-test. Also the mean change in ODI score for the patients who reported their condition as same following the injection and their 95% CI was calculated. The effect size was calculated as mean difference between the baseline scores and the follow up scores divided by the standard deviation (SD) of the baseline scores [7]. The effect size and the SRM were calculated separately for different groups of patients with lumbosacral radicular pain like spinal stensois, intervertebral disc prolapse and degenerative spondylolisthesis. The SRM was calculated as the mean change in score between the baseline and the follow-up scores divided by the SD of the change scores [8]. The correlation between mean change in score and the duration of the symptoms was also calculated using Pearson's correlation coefficient. Local ethics committee's approval was obtained. All the patients signed an informed consent prior to the procedure. The injections were given by the spinal surgeons in the operating theatre. The statistical analysis was done using SPSS software.

Results

The mean age of the patients in the cohort was 58 years (range 25–81). A total of 58% were females and 42% were males. The mean duration of symptoms was 11 month (SD −6.2). The minimum period of follow-up was 3 months. The mean Pre-injection ODI for 107 patients was 49(95% CI 46–52). The mean post-injection ODI at 6 weeks was 32(95% CI 28–35). The mean change in ODI was 16.9(95% CI 14–19). Fifty-three per cent of patients said their symptoms were much better as compared to pre-injection at 6 weeks, 34% reported their symptoms to be better, 7% as same, 5% as worse and 1% as much worse. The mean change in ODI for much better or much worse group was 22.0(95% CI 18–25). The mean change in ODI for better or worse group was 15.0(95% CI 10–19) (P = 0.01). The mean change in ODI for the same group was −0.6(95% CI −10 to 11). These show that the score moves in the same direction as the change in symptoms as rated by the patient, 63(59%) had spinal stenosis, 39(37%) had intervertebral disc prolapse, 5(5%) had listhesis. The results for mean pre-injection ODI and post-injection ODI and the

Table 1 Mean ODI score for different spinal pathologies, their effect size (ES) and the standardized response mean (SRM)

Diagnosis	No. of cases	Mean pre-ODI (95% CI)	SD	Mean post-ODI (95% CI)	SD	Mean change in ODI (95% CI)	SD	Effect size (ES)	SRM
Spinal stenosis	63	48(44–51)	15	32(27–36)	17	16(11–19)	14	1.04	0.85
Disc prolapse	39	50(44–55)	16	31(24–38)	20	19(14–23)	13	1.07	0.80
Spondylolisthesis	5	41(23–59)	15	25(12–37)	10	16(5–27)	9	0.83	2.0

SD Standard deviation, *SRM* standardized response mean, *CI* confidence interval, *ES* effect size

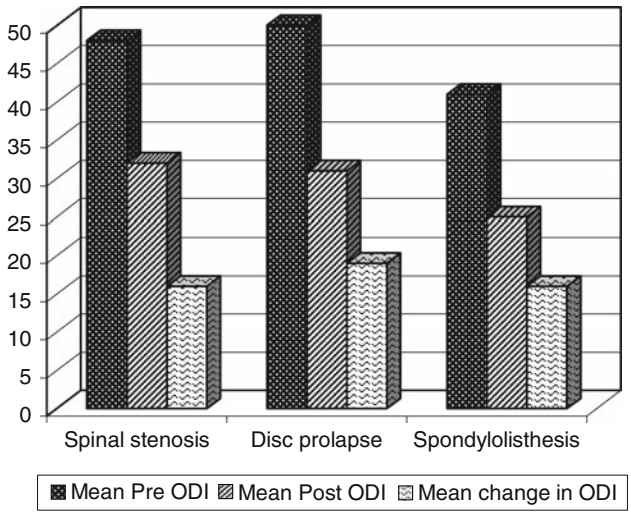

Fig. 1 Bar chart showing mean ODI score for different spinal pathologies

mean change in ODI for different spinal conditions are shown in Table 1 and Fig. 1. The effect size for the whole group was 1.05. The responsiveness as measured by SRM for the whole group was 0.84. The effect size for the spinal stenosis group was 1.04 and the SRM for this group was 0.85. The effect size and the SRM for disc prolapse group was 1.07 and 0.80, respectively. The effect size for listhesis group was 0.83 and for the SRM 2.0. There was weak to moderate correlation (r = 0.22) between mean change in ODI score and the duration of symptoms. This correlation was not statistically significant (P = 0.13). Moderate correlation was found between mean change in ODI scores following caudal epidural steroid injections and mean change in VAS scores. This correlation was statistically significant (r = 0.44, $P < 0.05$).

Discussion

Based on the results of this study, it appears that ODI has the ability to detect changes on group level corresponding to patient perception following caudal epidural steroid injections administered to patients with a variety of spinal conditions. A significant difference in ODI scores was noted between patients responding as much better or much worse as compared to better or worse (P = 0.01). This demonstrated the ability of this instrument to discriminate these degrees of change in patient's conditions.

The mean change in ODI for much better, much worse group was 22.0 and mean change in ODI for better or worse group was 15.0. This information can be used for power calculation in prospective studies. The change in mean ODI for the group as same was −0.6. This could be considered as the difference that occurred by chance and clinically cannot be considered as a real change in disability for the patient.

The tests for correlation of the Oswestry disability questionnaire with other pain scores have been done in the past. Gronblad et al. [8] examined the correlation of ODI with Pain disability index and Visual analogue score. They found a high correlation between ODI scores and the pain disability index, but only a moderate correlation with VAS (r = 0.62). We found a moderate correlation between mean change in ODI score and VAS scores. This correlation was found to be statistically significant ($P < 0.05$). There was a weak correlation between duration of symptoms and change in ODI following caudal epidural steroid injections (r = 0.22). The calculations of effectiveness of caudal epidural steroid injections for different spinal pathologies showed that for patients with spinal stenosis and with disc prolapse, the effect size was larger than the SRM, while for patients with degenerative spondylolisthesis, the same relationship could not be demonstrated. This in turn illustrates the problems encountered in interpretation of these findings (ES & SRM) when only one of these is given. Since the effect size is dependent on homogeneity of the group preoperatively and the SRM is dependent on the homogeneity of the change in disability following treatment, these calculations will differ by nature in any two groups. These two measures are commonly used in studies despite their significant limitations [9].

The use of ODI in other populations undergoing caudal epidural steroid injections with similar pathologies is needed to establish the level of consistency in the estimate of treatment effectiveness.

Conclusion

This study shows that ODI can detect change in disability over time in patients undergoing caudal epidural injections for lumbosacral radicular pain. It can also differentiate between small and large changes in the level of disability. ODI also demonstrates self-rated effectiveness following caudal epidural steroid injections for lumbosacral radicular pain.

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