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Research Article

Comparison of the Cost-utility Analysis of Electroacupuncture and Nonsteroidal Antiinflammatory Drugs in the Treatment of Chronic Low Back Pain

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Abstract
Introduction and objective: Chronic low back pain (CLBP) is among the most common and important reasons for visiting a spine surgeon by patients; it is the second cause of visiting a doctor. Low back pain can cause considerable suffering and is a major financial burden in the society. There are many different methods available for the treatment of CLBP. This study aimed to compare the cost-utility of electroacupuncture (EA) and nonsteroidal antiinflammatory drugs (NSAIDs), as two common treatment methods for patients with CLBP.
Methods: This study was conducted on 100 patients suffering from CLBP. Cases were randomly selected from patients referring to two hospitals and four acupuncture clinics in Tehran. Forty-one patients received EA, and 59 patients were prescribed NSAIDs. The EuroQol five dimensions questionnaire was used to calculate quality-adjusted life-year. For calculating the total cost of the two treatment methods, face to face interview with patients was conducted by the researchers (using specific basic literature questionnaire), neurologists, and spine surgeons. The study perspective was social (direct and indirect costs calculated).
Results: The mean age for EA group was 41 $\pm$ 2.3 years, and for NSAIDs group, it was 38.0 $\pm$ 4.4 years. The average of the utility of patients under treatment by EA and NSAIDs was estimated as 0.70 and 0.627, respectively. The difference in utility between the two groups was significant ($p \leq 0.05$). The total cost of EA and NSAIDs was estimated as 461.48 $\pm$ 57.8$ and 497.77 $\pm$ 85.2$ for one year (2016), respectively, which was also significant ($p \leq 0.05$).

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Conclusion: The results indicate a significant difference between EA and NSAIDs in cases of both utility and total cost. The findings demonstrate that EA is more cost-effective than NSAIDs, as therefore can be considered as an alternative treatment for CLBP, with reasonable cost-utility.

1. Introduction

Chronic low back pain (CLBP) is one of the most common and important reasons for visiting a spine surgeon by patients [1,2], and it is the most common type of pain in people experiencing any chronic pain. About 51% of Iranian population experience low back pain within their life time [3]. CLBP can cause serious problems in the public health and socioeconomic status of people worldwide; it affects the level of absenteeism and presentism at work [4,5]. Also, it changes the quality of life and functional performance [4].

The high prevalence of CLBP leads to rise in many private care visits, physician visits, consumption of drugs, and other uses of health services; therefore, it entails enormous health and economic costs [6]. Generally, people with CLBP use more health-care services compared to those with acute low back pain [7].

There are different methods for the treatment of CLBP, and most of the methods are supported by clinical practice guidelines [5,8]. According to The European Guidelines, these treatment options include medications, manipulation/mobilization, acupuncture, yoga, massage therapy, and multidisciplinary treatment [4]. Treatment cost, adverse effects, and complexity are some of the factors that undoubtedly play an important role in the growing interest in alternative therapies for CLBP.

Acupuncture is a method of traditional Chinese medicine. Numerous studies have investigated the effectiveness of acupuncture in the management of CLBP [9]. Electroacupuncture (EA) is the application of electrical stimulation on acupuncture needles. This technique can improve certain physiological reactions and can obtain faster and better therapeutic effects than manual acupuncture [10,11]. One of the advantages of using EA in clinical practice is the ability of the stimulation frequency and intensity to be set. Lehmann et al. showed that EA produces a greater reduction in pain scores than TENS (Transcutaneous Electrical Nerve Stimulation) in the treatment of chronic lower back pain [12]. Thomas and Lundberg in their study also demonstrated that low-frequency EA was effective in CLBP [13,14].

Nonsteroidal antiinflammatory drugs (NSAIDs) are frequently used in the treatment of low back pain. NSAIDs are prescribed to patients with acute low back pain for their pain and are recommended for short-term periodical use in patients with chronic back pain [4,15]. Enthoven et al. in a systematic review study showed that NSAIDs reduced pain and disability in patients with CLBP compared to placebo. However their study showed that the differences were small, and the number of adverse events was not significantly different between the patients receiving NSAIDs and those receiving placebo [16].

In recent years, cost-utility analysis (CUA) has been introduced and recommended as a method for the economic evaluation of health-care programs [17]. As EA and NSAIDs are quite common in the treatment of patients with CLBP, this study compared and evaluated the effectiveness and cost-utility of these two methods in relieving pain and improving the daily performance of patients with CLBP.

2. Materials and methods

This cross-sectional study was conducted in 2015—2016. Two groups of patients with CLBP who were referred to two hospitals in Tehran (Group 1) and four authorized acupuncture clinics also in Tehran (Group 2) were randomly selected. Patients were divided into two groups as patients with CLBP who used NSAIDs at least in recent six months (Group 1) and patients with CLBP who used at least five sessions of EA in recent six months (Group 2). Patients were excluded if diagnosed with acute low back pain or used less than 6 months of NSAIDs or EA. Patients who did not consent to participate in the study were also excluded. Finally, 100 patients (59 patients in Group 1 and 41 patients in Group 2) aged 20—65 years were included in the study.

Visual analog scale (VAS) of 0—100 and EuroQol five dimensions questionnaire were applied, respectively, for measuring the severity of pain and quality of life (utility). The analysis was done by *t* test, Kolmogorov—Smirnov and Shapiro—Wilk, and Mann—Whitney test. As the cost of EA was lower than that of NSAIDs and EA was more effective, incremental cost-effectiveness ratio was practically negative. Therefore, only the average cost-effectiveness ratio (ACER) was calculated.

The perspective of this study was social, and as such, both direct and indirect costs were calculated. The direct medical cost data were obtained from inpatient medical records for the two groups during one year. Direct costs included all expenses for diagnosis, treatment, and follow-ups. Thus, costs of diagnosis, visit, consultation, and costs of nonphysician services in both groups, plus costs of NSAIDs in Group 1 and costs of EA sessions in Group 2, were all included. The direct nonmedical costs and indirect costs were estimated by self-declaration of patients in each group.

Finally, the average total costs of treatment and care in each group was calculated by summing the average of direct medical, direct nonmedical, and indirect costs in each group. Indirect cost or productivity loss is referred to as presenteeism (working with illness, injury, anxiety, etc.) or absenteeism. To calculate the indirect cost, friction cost approach was applied [18]. In Iran, this method considers 80% and 40% average wage for loss of workdays and leisure

time lost during caring for patients, respectively [19]. The indirect cost data were collected through face-to-face or telephone interview using patient's self-estimate questionnaire (after informed consent was obtained). According to the number of missed workdays and the average net daily wage, indirect cost was calculated individually for each patient in the two groups. All related costs were calculated using average private and governmental prices, and final total costs were adjusted to USD (US$ 1.00 = IRR 35,000).

3. Results

One hundred cases were included in this study in two treatment groups: 41 patients in EA treatment group and 59 cases who were treated by NSAIDs. The mean age of the participants in NSAIDs and EA groups were 38 ± 4.4 and 41 ± 2.3, respectively. 68.2% of participants in EA group and 55.9% in NSAIDs group were male. The majority of patients in both groups had a job and was considered to be of active population (70.5% in EA group and 71.3% in NSAIDs group). The average income of the patients in NSAIDs and EA groups were 400 ± 25.7 USD and 457.14 ± 14.2 USD, respectively. In addition, the average time of patients with CLBP was 3.4 ± 1.8 years in NSAIDs group and 2.3 ± 1.2 in EA group. The mean scores of utility and severity of pain in the NSAIDs group were 0.63 ± 0.2 and 0.37 ± 0.21, while the scores were 0.70 ± 0.14 and 0.31 ± 0.17 in the EA group, respectively (Table 1).

No significant difference existed between the two groups in terms of age, sex, income, work, and score of severity of pain ($0.05 < p$), but there was a significant difference in the utility scores ($p \leq 0.05$) and time of patients with CLBP in the two groups ($p \leq 0.05$) (Table 1).

Cost analysis showed that the direct medical cost per patient was the main cost share (56.6% when treated by EA and 61.7% in treatment by NSAIDs) in these two treatment options for CLBP, and nonmedical direct costs was the smaller share (9.6% when treated by EA and 4.1% in treatment by NSAIDs). There was a significant difference in mean utility and total treatment costs per patient between EA and NSAIDs methods ($p < 0.05$) (Tables 1 and 2).

Table 3 shows the ACER of the two treatment methods. The ACER for EA therapy was 134.64 units less than the ACER for treatment by NSAIDs. Effectiveness (utility) of EA was about 0.07 units more than the effectiveness of NSAIDs, while the mean costs of EA per patient was about 36.29 dollars less than that of NSAIDs (Tables 1 and 2). Therefore, the incremental cost-effectiveness ratio of EA versus NSAIDs was negative. This implies that EA in comparison with NSAIDs is a dominant treatment option, and NSAIDs in comparison with EA are not dominant treatment options (Fig. 1).

4. Discussion

Analyses of this study demonstrated that ACER for EA was less than ACER for NSAIDs, while CUA showed that EA in comparison with NSAIDs was the dominant option for treatment of patients with CLBP.

Similar to this study, Ratcliffe et al. showed that a short course of traditional acupuncture for persistent nonspecific low back pain was more cost-effective compared with the usual care [13]. Also, Yank et al. represented that acupuncture versus no treatment was effective and should be advocated in the European Guidelines for the treatment of CLBP [20]. However, in this study, the cost-utility of EA was evaluated. The results showed that EA increased the utility more effectively than NSAIDs; also this difference was statistically significant between the two groups. The mean duration of CLBP in the EA groups was more than NSAIDs group, and this difference was statistically significant. Amanollahi et al. showed that acupuncture was more effective than oral piroxicam in reducing pain intensity in patients with mechanical CLBP [21]. Further, Lehmann at al. showed that EA was more effective than TENS in the rehabilitation of CLBP patients [12].

There was no observed significant difference between the two groups in terms of age, sex, income, and employment; thus the two treatment groups were adjusted. However, a significant difference was observed in the duration of CLBP in the two groups. There exists no similar study by which this variable can be compared.

Table 1 Demographic characteristics, the mean utility, and severity of pain scores of patients with CLBP under treatment by EA and NSAIDs.

Variables		EA	NSAIDs	*p*
Number of patients		41	59	
Age, mean ± SD, y		41 ± 2.3	38 ± 4.4	0.75
Sex, no. (%)	Male	68.2	55.9	1.32
	Female	31.8	44.1	
Working (%)	Yes	70.5	71.3	0.82
	No	19.5	18.7	
Average monthly income, Dollar (mean ± SD)		457.14 ± 14.2	400 ± 25.7	2.3
Average time with CLBP, year (mean ± SD)		3.4 ± 1.8	2.3 ± 1.2	0.03
Utility, mean ± SD, (EQ-5D)		0.70 ± 0.14	0.63 ± 0.2	0.04
Severity of pain, mean ± SD, (0—1 VAS)		0.31 ± 0.17	0.37 ± 0.21	0.39

CLBP = chronic low back pain; EA = electroacupuncture; EQ-5D = EuroQol five dimensions; NSAIDs = nonsteroidal antiinflammatory drugs; SD = standard deviation;VAS = visual analog scale.

Table 2 Total costs of two treatment options for patients with CLBP (US dollars).

Type of cost	EA		NSAIDs		*p*
	Cost (mean ± SD)	Percent (%)	Cost (mean ± SD)	Percent (%)	
Direct medical costs	261.14 ± 25.7	56.6	302.93 ± 77.3	61.7	—
Nonmedical direct costs	44.29 ± 13.1	9.6	20.2 ± 14.5	4.1	—
Indirect costs	156.05 ± 33.4	34.2	174.42 ± 15.9	34.2	—
Total	461.48 ± 57.8	100	497.77 ± 85.2	100	0.043

CLBP = chronic low back pain; EA = electroacupuncture; NSAIDs = nonsteroidal antiinflammatory drugs; SD = standard deviation.

Table 3 Average cost-effectiveness ratio of the two treatment methods.

Treatment method	Utility	Cost per patient ($)	ACER
NSAIDs	0.627	497.77	793.9
EA	0.70	461.48	659.26

ACER, average cost-effectiveness ratio; EA = electroacupuncture; NSAIDs = nonsteroidal antiinflammatory drugs.

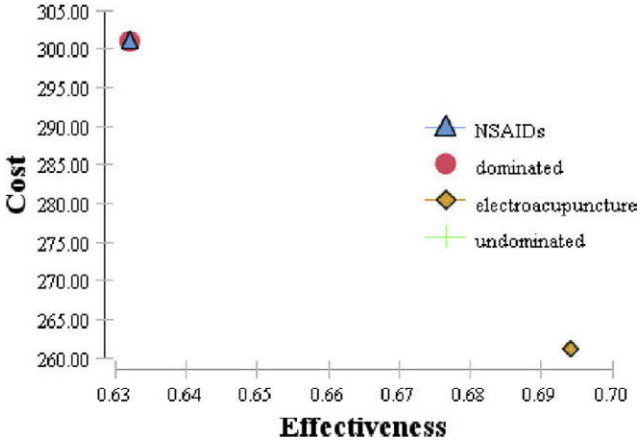

Figure 1 Cost-effectiveness analysis; EA versus NSAIDs. EA = electroacupuncture; NSAIDs = nonsteroidal antiinflammatory drugs.

This study was the first CUA of EA and NSAIDs by EuroQol five dimensions questionnaire and visual analog scale, but there were some limitations. The most important limitations of the study were the small sample size and the absence of follow-up period (cross-sectional study). In addition, samples were not matched for the duration of CLBP diseases in the two groups. Furthermore, the costs of probable adverse effects were not included here; if these costs had been included, the difference of the ACER would have been bigger. Like any therapeutic approach, acupuncture might have adverse effects. If it is used according to established safety rules and carefully at appropriate anatomic regions, it is a safe treatment method [22] and side effects of EA also rarely occurs, while NSAIDs have certain gastrointestinal, cardiovascular, and renal side-effects, which are quite common [23—25]. Considering these side-effects, NSAIDs would be less useful and less cost-effective to treat CLBP compared with acupuncture and EA.

Despite the cost-effectiveness of EA, many patients might not choose to undergo multiple weekly sessions of acupuncture, mostly because accessing appropriately trained providers is difficult, it is not easy to schedule for socially active patients, and the payment for acupuncture services is mostly out of pocket. Therefore, EA can be considered a useful adjunct to preventive lifestyle strategies and appropriately targeted drug therapy in some cases.

5. Conclusion

The results indicate a significant difference between EA and NSAIDs effectiveness and total costs. Despite the mentioned limitations, this study was a full economic evaluation, and it included all costs of treatment by EA and NSAIDs for patients with CLBP. The findings of this study demonstrated that EA was more cost-effective than NSAIDs. The results of this study are useful for decision making in health-care system. There might be other available reasons for proposing and replacing EA for treating patients with CLBP.

Disclosure statement

The authors declare that they have no conflicts of interest and no financial interests related to the material of this manuscript.

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