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Clinical efficacy of simple decompression versus anterior transposition of the ulnar nerve for the treatment of cubital tunnel syndrome: A meta-analysis

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ABSTRACT

Objectives: The aim of this study was to evaluate the clinical efficacy of simple decompression (SD) versus anterior transposition (AT) of the ulnar nerve for the treatment of cubital tunnel syndrome.

Methods: Seven public databases (PubMed, MEDLINE and EMBASE, Springer, Elsevier Science Direct, Cochrane Library and Google scholar) were searched from 1971 to December 2013. The overall odds ratios (OR) and their 95% confidence intervals (CI) were pooled to compare the clinical outcomes. Subgroup analysis was performed based on the region, study type, Jadad score, type of AT, and follow-up duration. Meta-analysis was conducted by using Rev. Man 5.1 and Stata 11.0 software.

Results: Finally, we included 13 studies involved 1009 (500 patients receiving SD and 509 patients receiving AT) patients with cubital tunnel syndrome. The overall estimate (OR = 0.91, 95% CI = 0.67–1.23, $P = 0.536$) indicated that there was no significantly statistical difference between the clinical outcomes of patients treated with SD and AT. Meanwhile, subgroup analyses by region, study type, Jadad score, type of AT and follow-up duration showed the consistent results with the overall estimate. In addition, we found that the incidence of complications in patients treated by SD was significantly lower than that in patients treated by AT (OR = 0.32, 95% CI = 0.17–0.60, $P = 0.05$).

Conclusions: In conclusion, although SD had equivalent clinical outcomes with AT for the treatment of cubital tunnel syndrome, SD should be preferred due to having lower incidence of complications.

1. Background

Cubital tunnel syndrome, also known as ulnar neuropathy at elbow, is the second most common compression neuropathy after carpal tunnel syndrome, and advanced disease is complicated by irreversible muscle atrophy and hand contractures [1]. In Italy, the incidence of ulnar neuropathy at elbow is approximately 21–25 cases per 100,000 persons each year in general population [2]. In addition, it was reported that the prevalence of cubital tunnel syndrome varied from 2.8% among workers whose occupations required repetitive work to 6.8% in floor cleaners [3,4].

Anterior transposition (AT) of the ulnar nerve has proved to be an effective therapy in ulnar neuropathy at elbow [5,6]. The two most common ulnar nerve AT are anterior subcutaneous transposition (AST) and anterior submuscular transposition (ACT) [7]. Although a number of surgical options are available, simple decompression (SD) of the ulnar nerve can also achieve satisfactory results with appropriate patient selection [8]. As described by Feindel and Stratford, SD was an operation with free of complications and postoperative morbidity and can be performed in local anesthesia [9]. Besides, SD also has other advantages, including simplicity and safety [10].

However, it is still a controversy whether the clinical efficacy of SD is superior to anterior transposition (AT) for the treatment of

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cubital tunnel syndrome. A recent article reported that the patients treated with AT had inferior outcome when compared with patients treated with SD and partial epicondylectomy [11]. Meanwhile, another article reported that although both SD and AT had a good outcome, the SD should be preferred due to less invasion [12]. However, two previous meta-analyses have suggested that there was no statistically significant difference between SD and AT [13,14]. Therefore, in order to update the meta-analysis and achieve more reliable results, we included more relevant studies to compare the clinical efficacy of SD and AT for treating patients with cubital tunnel syndrome in this study.

2. Methods

2.1. Publication search

Seven public databases (PubMed, MEDLINE and EMBASE, Springer, Elsevier Science Direct, Cochrane Library and Google scholar) were searched from 1971 to December 2013 to identify studies involving efficacy comparison of SD or AT for patients with cubital tunnel syndrome. The keywords such as "simple decompression", "anterior submuscular transposition", "anterior subcutaneous transposition", "anterior transposition", "ulnar nerve" and "cubital tunnel syndrome" were used for searching. Meanwhile, references from retrieved papers were checked for any additional studies.

2.2. Inclusion and exclusion criteria

Inclusion criteria of studies contained the followings: (1) the study was a published randomized controlled trails, prospective studies, retrospective studies or cross-sectional studies; (2) the participants were patients with cubital tunnel syndrome (or ulnar neuropathy at the elbow); (3) patients were treated by either SD or AT; (4) the patients treated with SD were experiment group and the patients treated with AT (AST or ACT) were control group; (5) the outcomes were the improvement of clinical symptoms; (6) the effect size was odds ratio (OR). We excluded the studies such as reviews, letters or conferences. In addition, the duplicated publications were excluded except the one that contained the most complete information.

2.3. Data extraction and quality assessment

Two investigators independently screened literatures and extracted data using the standard protocol. Differences and disagreements were resolved through discussion with our research team to come to an agreement. The extracted data included the general information of studies (the first author's name, year of publication, region and study type), characteristics of participants (age, gender, ethnicity and sample size), and clinical outcomes (evaluation criteria of clinical outcomes and follow-up duration).

The Jadad scoring system was used to evaluate the quality of studies included in the meta-analysis. The studies scored larger than 3 were considered as high quality studies.

2.4. Meta-analysis

Analyses were performed using the software Review Manager 5.1 (Cochrane Collaboration, http://ims.cochrane.org/revman) and the STATA software package v.11.0 (Stata Corporation, College Station, TX, USA). The overall OR and its 95% confidence interval (95% CI) were calculated for the comparison. The significance of the pooled OR was determined by the Z-test and P-value < 0.05 was considered statistically significant. Heterogeneity among the studies was assessed by Cochran's Q and I^2 statistic [15,16]. A P-value < 0.05 and I^2 value > 50% were considered significant heterogeneity. When significant heterogeneity was found, the data was summarized by fixed-effect model (Mantel–Haenszel method) [17]. Otherwise, random effect model (DerSimonian and Laid method) were used [18].

Subgroup analysis was performed based on the region, study type, Jadad score, type of AT, and follow-up duration. Sensitivity analysis was performed by omitting each study in turn to assess the stability of the results. Publication bias was measured by funnel plot and statistically assessed by Begg's test and Egger's linear regression test with the P-value < 0.05 [19].

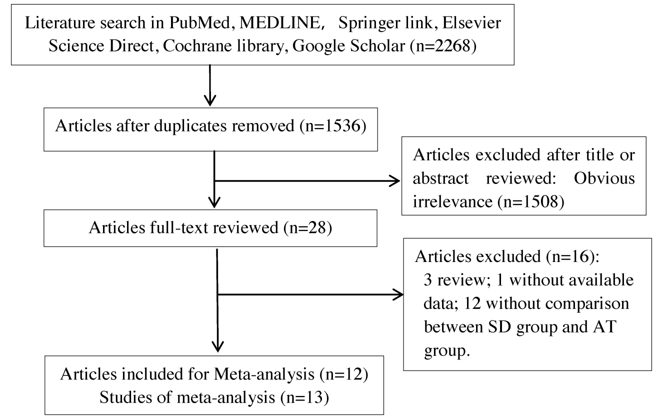

Fig. 1. Flow diagram of literature search and study selection.

3. Results

3.1. Literature search

The details of literature search were presented in a flow diagram (Fig. 1). A total of 2268 potentially relevant literatures (461 from PubMed, 237 from MEDLINE, 692 from Springer, 528 from Elsevier Science Direct, 16 from Cochrane Library and 334 from Google Scholar) were found in the initial search. After removing duplicates, 1536 literatures were remained. Then 1508 of them were excluded by scanning the titles and abstracts. After this, 28 remaining articles were full-text reviewed. Finally, 12 articles [6,11,12,20–28] including 13 studies met the inclusion criteria and were included in the meta-analysis.

3.2. Study characteristics

The characteristics of the 13 studies were presented in Table 1. These studies including 6 prospective studies [6,12,20,21,26] and 7 retrospective studies [11,22–25,27,28] were published from 1970 to 2010. Among them, 5 studies investigated the comparison of SD vs. AST [12,20–22,26] and 8 studies investigated the comparison of SD vs. ACT [6,11,20,23–25,27,28]. The studies were conducted in America [20,23,27,28], Europe [3,5,6,20,22,23] and Australia [21,24]. A total of 1009 (500 patients receiving SD and 509 patients receiving AT) cubital tunnel syndrome patients were included in this study. The clinical outcomes were evaluated based on different criteria in the studies. The average follow-up duration ranged from 12 to 76 months. Four out of 13 studies [6,12,21,26] were the high quality studies with the score over 3.

3.3. Comparison of clinical outcomes between SD and AT

There was no heterogeneity among studies (P = 0.891, I^2 = 0.0%), so the fixed effect model were used to pool the data. The overall estimate (OR = 0.91, 95% CI = 0.67–1.23, P = 0.536, Fig. 2)