Effects of Metabolic Syndrome on the Outcome of Carpal Tunnel Release: A Matched Case-Control Study

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Purpose To compare outcomes of carpal tunnel release in patients with or without metabolic syndrome.

Methods In a prospective consecutive series, 35 patients with metabolic syndrome and surgically treated carpal tunnel syndrome (CTS) were age- and sex- matched with 37 control patients without metabolic syndrome. Grip, pinch strength, perception of touch with Semmes-Weinstein monofilament, and Boston Carpal Tunnel Questionnaires (BCTQ) were assessed preoperatively and at 3, 6, and 12 months postoperatively.

Results Patients with metabolic syndrome had more severe electrophysiologic grade of CTS than those without metabolic syndrome, but the 2 groups had similar preoperative grip/pinch strength and BCTQ scores. The BCTQ symptom score for the metabolic syndrome group was significantly greater than that of the control group at 3 months, and the BCTQ function score of the metabolic syndrome group was significantly greater than that of the control group at 3 and 6 months' follow-up. However, there was no significant difference in BCTQ symptom or functional scores between groups at 12 months' follow-up. There was no significant difference in grip strength between groups through 12 months' follow-up whereas the pinch strength of the control group was significantly greater than that of the metabolic syndrome group at 12 months' follow-up. Semmes-Weinstein monofilament test results were significantly greater in the control group than in the metabolic syndrome group at 3 and 6 months' follow-up but were similar at 12 months.

Conclusions Patients with CTS and metabolic syndrome have delayed functional recovery after carpal tunnel release, but noteworthy improvements in symptom severity and hand function are similar to those in patients without metabolic syndrome 1 year after surgery. *(J Hand Surg Am. 2015;40(7):1303–1309.*

Type of study/level of evidence Prognostic II.

Key words Carpal tunnel syndrome, metabolic syndrome, surgical outcome.

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CARPAL TUNNEL SYNDROME (CTS) is the most common entrapment neuropathy in the upper extremity, with an incidence of 1 to 5 per 1,000 person-years.[1] The number of patients with CTS surgically treated in the United States is between 400,000 and 500,000/y.[2] The number of elective hand surgeries for CTS in the United Kingdom has almost doubled over the decade from 1990 to 2000.[3] Although carpal tunnel release (CTR) is considered the definitive treatment for CTS, studies taking patients with medical comorbidities into account are lacking.[4] Thus, treatment

recommendations for patients with CTS and medical comorbidities are inconclusive.

Metabolic syndrome is a constellation of medical conditions arising from insulin resistance and abnormal adipose deposition and function. The National Cholesterol Education Program Adult Treatment Panel III definition[5] has been widely used because it is simple and its components are easily and routinely measured in most clinical and research settings.[6] Metabolic syndrome is defined by the presence of at least 3 of the following 5 criteria: a clinical diagnosis of diabetes with dietary oral or insulin treatment or a fasting serum glucose level of 110 mg/dL or higher; arterial blood pressure of 130/85 mm Hg or higher or current use of antihypertensive medication; a plasma triglyceride level of 150 mg/dL or higher; a high-density lipoprotein cholesterol level of less than 50 mg/dL for females or less than 40 mg/dL for males; and a waist size higher than 80 cm for females or higher than 90 cm for males (for Asian populations) or body mass index greater than 30. The prevalence of metabolic syndrome is increasing dramatically as a result of the expanding aging population and the obesity epidemic in industrialized countries, and it poses a major public health challenge.[7,8] Diffuse peripheral nerve impairment is common in metabolic syndrome, and a high prevalence of hyperlipidemia and hypertension in patients with peripheral neuropathy has been reported.[9] Metabolic syndrome is 3 times more frequent in patients with CTS.[10] The relationship between metabolic syndrome and neuropathy has been demonstrated outside the setting of overt diabetes because microangiopathy leads to axonal damage and ischemia of the nerve.[9,10] Furthermore, metabolic risk factors such as obesity, dyslipidemia, and diabetes mellitus are individual risk factors for CTS.[11] Metabolic syndrome as a co-occurrence of these diseases might affect the outcome of CTR.

With the increasing prevalence of metabolic syndrome with co-occurrence of CTS, it is important to assess the effect of this syndrome on postoperative outcome. The objective of this study was to compare the outcome of CTR in patients with or without metabolic syndrome. We hypothesized that patients with CTS and metabolic syndrome would have decreased functional scores on both objective and subjective measures of function compared with those without metabolic syndrome within 1 year after CTR.

MATERIALS AND METHODS

Our institutional review board approved this study. Between January 2012 and November 2013, consecutive patients with a diagnosis of CTS who were treated surgically were enrolled in this study. We initially identified 42 patients with CTS and metabolic syndrome; they were age- and sex-matched with 42 patients with CTS and without metabolic syndrome. Diagnosis of CTS was based on symptoms and findings of CTS confirmed by nerve conduction studies. Symptoms included paresthesia and/or pain in at least 2 of the median nerve-innervated fingers. Other symptoms included weakness and loss of dexterity of the hand. Physical examination for sensory loss, decreased thenar muscle strength, Tinel sign, and Phalen test were used to reinforce the diagnosis. Electrophysiologic studies were performed before surgery. We used the 7-grade classification by Bland[12] (grade 0 = normal to grade 6 = extremely severe) based on conduction time and amplitude. We subcategorized grades 0 and 1 as mild, grades 2 and 3 as moderate, and grade above 3 as severe. In case of bilateral involvement, the more severely affected side was chosen for comparative analysis. The diagnosis of metabolic syndrome was based on the National Cholesterol Education Program Adult Treatment Panel III definition.[5] Surgery was recommended when symptoms of tingling, pain, or weakness did not improve after at least 2 months of conservative treatment, which consisted of placement of orthosis and use of nonsteroidal anti-inflammatory drugs and/or corticosteroid injections. In case of bilateral CTS, bilateral CTR in the same surgical setting was recommended only under special circumstances. Most commonly, this occurred when patients needed minimal downtime from work (surgeons, dentists, and desk workers). Careful attention was given to counseling these patients regarding potential self-care issues in the postoperative course. We excluded patients who had previous carpal tunnel surgery, polyneuropathy, cervical radiculopathy, focal nerve entrapment other than CTS, pregnancy, hypothyroidism, rheumatoid arthritis, or an inability to complete a self-reported questionnaire. Of 84 eligible subjects, 6 were excluded (2 in the control group and 4 in the metabolic syndrome group) and 6 were lost to follow-up (3 in the control group and 3 in the metabolic syndrome group). Thus, 35 patients with metabolic syndrome and 37 control patients without metabolic syndrome formed the basis for all subsequent analyses.

Two hand surgery specialists performed CTR using the same technique. A 2- to 3-cm longitudinal incision along the thenar crease was made 1 cm distal to the wrist crease in line with the third web space. The transverse carpal ligament was incised and decompressed without