INTRODUCTION

As regard to the pathophysiology of CTS, recent MRI studies have demonstrated that tenosynovial thickening within carpal tunnel is the most constant finding. However, histological studies denied the involvement of inflammation. Therefore, the pathomechanism of tenosynovial swelling is unknown at present. Edema, fibrosis, collagen degeneration, vascular stenosis, and angiogenesis are the most often encountered histological changes. The purpose of the present study was to analyze the role of tenascin-C and versican, which have often been found to be involved both in tissue remodeling and vascular stenosis in the pathogenesis of CTS.

MATERIALS AND METHODS

Subjects: The study group consisted of 40 patients (12 men and 28 women) who were treated surgically for idiopathic CTS. The patients' mean age was 53.18 years (range, 31 to 79 years). Patients with a history of diabetes mellitus, inflammatory arthritis, autoimmune disorders, thyroid abnormalities, or renal failure, were excluded. The patients were divided into 4 groups based on disease duration. The groups included: group A (< 3 months), group B (group 4 - 6 months), group C (7 - 12 months) and group D (> 12 month). Most of the patients in group D had had mild numbness in the median nerve distribution for years, however, abrupt worsening of their symptoms had led them to choose surgery. Written informed consent was obtained from all patients and a standard open carpal tunnel release was performed and the tenosynovium was removed and analyzed.

Histological analysis: Paraffin-embeded specimen of the flexor tenosynovium were stained with hematoxylin and eosin (HE) and Sirus red. Immunohistochemical studies were performed with a polyclonal rabbit anti-tenascin-C antibody and monoclonal anti-versican antibody (MBL, Nagoya, Japan).

RESULTS

Histological abnormalities were noticed in the vessels, synoval lining, and loose connective tissue. Vessel abnormalities included: medial hyperplasia, intimal hyperplasia, occlusion by thrombi and vascular proliferation. Sirus red staining demonstrated that the major collagen component in group A was type I collagen, while that in group C and D was type III collagen (Figure 1). Tenascin-C was temporarily expressed at the vessel wall, the synoval lining, and the fibrous tissue with its expression regulated differently in each tissue. Tenasin-C expression by the vessels and expected to cause the mixoid ECM to degeneration. In contrast, in group C in which most of the vessels show severe stenosis, tenascin-C expression significantly downregulated and confined to neointima (Figure 2). The most intriguing finding in this study is that versican expression by connective tissue and neointima is well correlated with vascular tenascin-C expression. Connective tissue highly and diffusely expresses versican inevitably when vessels, even a fraction of vessels, highly express tenascin-C as appreciated from Figure 2 and 3. It is also noted that neointima express both tenascin-C and versican in group C and D, indicating that not only endothelial cell proliferation but also ECM deposition contribute to severe vascular narrowing.

DISCUSSION

Scelsi demonstrated that the histological findings of the tenosynovium change with disease progression. Neal reported that vascular changes such as thickening of the vessel wall, intimal hyperplasia, and thrombi formation are often seen. The present study demonstrated that there may be some link between vascular lesions and connective tissue change. Our previous study showed that both tenascin-C and versican are expressed intensely by the coronary artery after percutaneous transluminal coronary angioplasty and strongly induce neointimal formation. High expression of the molecule at the neointima indicates that vascular stenosis is caused by similar mechanism in CTS. In contrast, tenascin-C expression by adventitia and media may have different role in CTS. Although these tissues do not express versican, high tenascin-C expression by them inevitably induces diffuse expression of versican by connective tissue. Versican is a large proteoglycan which has a significant mass effect by the highly interactive and water entrapping nature. Therefore, versican highly expressed in the connective tissue expected to cause the mixoid ECM to swell. Both intracarpal pressure from flexor tenosynovial swelling and vascular insufficiency from vascular lesion seem to play significant role in the progression of the connective tissue degeneration.

REFERENCES