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WOUND HEALING AFTER HAND SURGERY IN PATIENTS WITH SYSTEMIC SCLEROSIS - A RETROSPECTIVE ANALYSIS OF 41 OPERATIONS IN 19 PATIENTS

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Summary

This retrospective study evaluates the results of 41 consecutive hand and forearm operations in 19 patients with systemic sclerosis performed between 1985 and 2000. The mean age was 50 (14 – 84) years. Twenty-seven operations were elective and fourteen considered acute with spontaneous wounds and/or skin necrosis as the cause of surgery. One minor wound healing problem occurred in the elective group. In the acute group, seven of 14 operations healed uneventfully. Two patients had consecutive wound infections. Another patient healed shortly after he quit smoking. Four patients had necrosis/infections, which required additional surgery. In systemic sclerosis, surgery performed in elective operations does not seem to have an increased rate of impaired wound healing. Even larger operations like wrist arthrodesis or wrist prosthesis can be performed. In non-elective cases with spontaneous skin necrosis and critically ischemic fingers, wound healing is not as obvious and several operations sometimes necessary.

Introduction

Scleroderma is a rare autoimmune connective tissue disease and was first described in 1753 by Carlo Curzi at Ospedale degli incurabili in Napoli. The etiology is unknown but the disease is characterized by a pathological remodeling of connective tissues, based on both a microvascular injury and abnormalities of the immune system (Abraham and Varga, 2005). A common finding and cause of the clinical manifestations is an increased production of fibrous tissue (Jun et al., 2003), which leads to the microvascular injury and the characteristic thick rigid skin. The incidence in the literature as reported is 4-6/1 million inhabitants (Geiresson et al., 1994; Silman et al., 1988), which in Sweden would correspond to approximately 35-40 new patients every year. The disease is more frequent in women than in men (Nalebuff 1999; Silman 1991) and peaks in the early adult years (Hesselstrand et al., 1998). The word scleroderma is greek and means hard skin but due to an often systemic organ involvement, the disease is sometimes referred to as systemic sclerosis. The esophagus and other parts of the gastrointestinal system are involved (dysmotility and reflux) in almost 90% (Silver et al., 1991) and further the lungs (fibrosis), the genito-urinary tract, kidneys and the heart.

The major implications of the disease regarding the hand have been discussed by Nalebuff (1999) and have to be addressed specifically in this disease for the treating hand surgeon (Fig 1).

A. Decreased microcirculation: In approximately 95 % (LeRoy et al., 1988) of the patients Raynaud's phenomenon appears due a vasospasm of the digital arteries as a reaction to low temperature. The microcirculation decreases, which is a risk factor for skin necrosis, ulcers and sometimes gangrene, especially of the fingertips (Chung and Fiorentino, 2006).

B. Skin tightness and joint stiffness: The patients lose the ability of active extension in the proximal interphalangeal (PIP) joint, which can lead to a flexion contracture. The increased tightness over the joint in combination with reduced microcirculation may in consequence lead to a fibrosis of the extensor apparatus and the covering skin. Due to compensatory hyperextension in the metacarpophalangeal joint (MCP), those joints are at risk of extension contracture (Nalebuff 1999).

Because of the decreased peripheral arterial circulation and sclerodactyly, impaired post-operative wound healing is feared for and although not supported by the literature (Bogoch and Gross, 2005), sometimes makes the rheumatologist and the hand surgeon cautious which could delay necessary surgical interventions.

Our unit is the national reference hospital for systemic sclerosis in Sweden. In this retrospective analysis we report the results after different kinds of operations performed on the hand and forearm in patients with systemic sclerosis, with special reference to impaired wound healing, in order to be able to give better recommendations.

Patients and methods

This retrospective study evaluates the results of 41 consecutive operations performed in 19 patients between 1985 and 2000. The majority of the Swedish scleroderma patients are treated at the Department of Rheumatology of the University Hospital of Lund, being the national referral hospital for medical and surgical treatment of the disease. All patients were identified retrospectively by scrutinizing the computerized operation log for all patients in the scleroderma register at the department of rheumatology. The mean age was 50 years (14 – 84 years). 16 of the patients were female and 3 male. 12 of the patients were operated more than twice. The operations were split into two groups, one acute consisting of patients presenting with a wound or a skin necrosis in need of a revision, and an elective group without spontaneous wounds as the presenting symptom (Fig 2). 14 operations were considered to be acute whereas in another 27 operations more general or disease specific complaints were the reason for the operation. The different types of operations (Table 1) in the elective group were skin problems in 10 patients, nerve problems in 7 and bone and joint problems in 10. The operations were: excision of calcinosis in 8, excision of calcinosis plus skin transplant in 2, neurolysis (either forearm or wrist level) of median, radial or ulnar nerve in 7, arthrodesis/prosthesis/Kapandji procedure of the wrist in 3 and other procedures (e. g. finger arthrodesis, removal of osteosynthesis material, finger osteotomy) in 7 operations. In the acute group the patients were operated on for skin defects/necrosis and the operations were amputation in 3 cases, wound revision in 6 cases and wound revision with flap 5 cases (including skin transplantation in 3 of these patients). 2 patients had both elective and acute operations performed, none of which were revised again. 13 patients underwent only elective surgery and 4 patients only acute.

Results

In the 27 elective operations only one patient did not heal directly and uneventfully. This patient was operated with an arthrodesis of the small finger PIP-joint but had a skin infection. The wound healed after removal of a cerclage wire.

In the 14 acute operations, 7 healed uneventfully and 7 operations in 4 patients had healing problems. The first patient was amputated in 3 digits; one of the fingers became infected post-operatively and was revised one month later (fig 2A). The wound decreased in size over the following months but the patient developed necrosis in the other two previously operated digits. These wounds were not healed as the patient died two years later. The second patient underwent wound revision of a finger tip necrosis, which never completely healed during a three-years-follow-up and the patient was then lost to follow-up controls. The afflicted finger is healed today but additional surgery has been performed because of spontaneous infected wounds in other fingers. A third patient had a wound revised on a finger and a skin flap. The healing period was prolonged and complete healing was first established after five months. A fourth patient had a spontaneous wound at the dorsum of the hand. He was operated with a local flap but did not heal in 3 months and a rotation flap was made. The patient was finally convinced to quit smoking and the wound healed in a couple of weeks. After starting smoking again the wound returned and was healed first after a flag flap. This patient was operated with an ulnar nerve neurolysis in the meantime without wound healing complications.

Discussion

The scleroderma patients do suffer from substantial limitations in the activities of daily living. The limitations correlate to the function of the arm and hand as measured with hand function tests but also to the severity of the disease and general well being (Sandquist et al., 2004). There exist only few reports of the results of surgery and how surgery might influence the function and quality of life in this rare patient group. All published studies have been summarized in a recent meta-analysis (Bogoch and Gross, 2005). In the largest published series, consisting of 272 elective operations in 70 patients, no wound healing complications were found but the patients were only referred to and never described (Melone et al., 1999). In PIP joint surgery, which is relatively common due to contracture, a couple of studies have reported favorable results with uneventful healing in PIP arthrodeses (Lipscomb et al., 1969; Jones et al., 1987). In one study, all chronic ulcers healed after the operation (Gilbart et al., 2004). When Swanson PIP arthroplasties were chosen, the results were poor with slow wound healing in 4 out of twenty implants and extraction of the prostheses were necessary in two joints (Norris and Brown, 1985).

Surgery in systemic sclerosis is considered demanding, due to suboptimal conditions for wound healing because of a microangiopathy. In analogy with the diabetic extremity, where also a microangiopathy exists, a fear for wound healing problems makes the rheumatologist and the surgeon sometimes hesitate to continue with surgery. Necessary surgery might be delayed or refused in the elective group of patients. In previously published series, surgical interventions in scleroderma patients generally were followed by uncomplicated wound healing (Bogoch et al., 2005). Also in our series we do not seem to have an increased rate of infections or other wound healing problems in the *elective* operations, also when larger operations like wrist arthrodesis or wrist prosthesis were performed. These patients, without a

spontaneous wound as the presenting symptom, do not seem to develop a critically ischemia as the oxygen need increases in the healing phase after the operation, and the parallel to the ischemic patient is not applicable.

In the acute operations, which are often performed in more severely ill patients, due to infections in critically ischemic fingers, the wound healing is not as obvious. Several operations are often needed, but often a good end result can be achieved without the need for amputations. In our series, in one case, it was enough that the patient gave up smoking, an obvious but not always fulfilled prerequisite for wound healing in this patient category. Smoking is of course extremely improper but patients sometimes refuse to stop. Repeated revisions might also be necessary if the infection persists and in cases with pain. If the necrosis is painless and dry, one can wait and expect a demarcation and auto amputation just as in the diabetic foot or hand. In larger necrotic area in the dorsum of the hand or finger with an intact distal circulation, revisions have to be supplemented with a skin flap. Full thickness skin grafts are not sufficient and rotational flaps like the flag flap preferred. The use of rotation flaps or pedicle flaps has its potential morbidity with healing problems not only at the recipient site but also at the donor site with its microangiopathy. In our series this has not been a problem and in the few cases they have been needed, the flaps healed uneventfully both at the donor and the recipient site. Maybe, the rising of a flap even can be considered as an elective procedure at the donor level.

In conclusion, we should not fear to offer surgical solutions to a defined problem to the sclerodermic patient without a wound or necrosis as the presenting symptom. However, patients presenting with necrosis and ulcerations should be monitored carefully, having a sometimes extended healing period.

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Tables

Table 1 - Procedures listed for each group

Elective group

<u>Procedure</u>	<u>Number of patients</u>
Excision of calcinosis	8
Excision of calcinosis + skin transplant	2
Neurolysis	7
Arthrodesis/prosthesis/Karpandji	3
Other procedures	7
Total	27

Acute/subacute group

<u>Procedure</u>	<u>Number of patients</u>
Amputation	3
Wound revision	6
Wound revision with flap	5
Total	14

Legends

Figure 1

Due to fibrotic hypertrophy, difficulties in surgery in the sclerodermic hand are characterized by (A) peripheral ischemia due to small vessel angiopathy, (B) skin tightness and (C) joint contracture.

Figure 2

The patients can present with an acute dry or wet peripheral necrosis sometimes even with naked bone (A). Other patients show less serious signs of the disease and seek help for more elective conditions like calcifications (B + C) or arthritic changes (D).