

Sialography of the Transplanted Submandibular Gland

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ABSTRACT Autologous transplantation of submandibular gland (SMG) is effective for severe keratoconjunctivitis sicca (KCS). Sialography is a method for morphological evaluation of the transplanted gland. We recruited 15 patients (15 eyes) with severe KCS who had successfully undergone SMG transplantation. Thirteen patients had normal transplanted SMGs, while two patients were suspected to have obstructive sialadenitis of the transplanted SMG. Sialography was performed in each patient with meglumine diatrizoate. Projections were applied immediately and 5, 7, and 10 min after contrast injection. The median dose of the contrast medium was 0.9 ml (range, 0.7–1.1 ml) for the full-size transplanted SMGs and 0.5 ml for the glands after reduction surgery. The acini and the ducts were clearly visible on sialograms. The contrast medium was completely excreted in 10 min in normal transplanted SMGs. The main duct had a regular shape in normal transplanted SMGs, while irregular dilation and stricture of the duct with delayed excretion of the contrast medium were found in the glands with obstructive sialadenitis. In conclusion, sialography is

clinically feasible and valuable for the morphological evaluation of the transplanted SMG.

KEY WORDS keratoconjunctivitis sicca, morphology, sialadenitis, sialography, submandibular gland, transplantation

I. INTRODUCTION

Keratoconjunctivitis sicca (KCS) is a multifactorial disease of the tears and ocular surfaces that results in discomfort, visual disturbance, and tear film instability with possible damage to the ocular surface.¹ The severe form of KCS had no effective treatment before the advent of microvascular autologous transplantation of the submandibular gland (SMG).² SMG transplantation with insertion of Wharton's duct into the upper conjunctival fornix provides a continuous, endogenous source of ocular lubrication and offers a good prognosis in severe KCS.²⁻⁷ The secretory function of the transplanted SMG can be evaluated by several methods.^{8,9} However, to our knowledge, there is no literature referring to the morphological evaluation of the transplanted SMG.

In most patients who have undergone SMG transplantation, the transplanted gland shows normal secretion, and the symptoms of dry eye are obviously relieved.²⁻⁷ However, in some patients, the transplanted SMG produces little and viscous secretion, which is very similar to the secretion in chronic obstructive parotitis, and the symptoms of dry eye are not relieved.^{6,10}

Sialography is one of the main techniques for the morphological evaluation of major salivary glands and for the diagnosis of chronic obstructive parotitis and Sjögren syndrome. For the first time, the present study applied sialography to assess the radiographic anatomy of the transplanted SMG and investigated the role of this technique in the diagnosis of obstructive sialadenitis of transplanted SMGs.

II. PATIENTS AND MATERIALS

This study was approved by the Ethics Committee for Human Experiments at Peking University and was in accordance with the Declaration of Helsinki guidelines for human

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OUTLINE

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research. All patients provided informed consent prior to participation in this study.

Of 51 patients with severe KCS who successfully underwent microvascular autologous SMG transplantation in Peking University School of Stomatology and were followed up between December 2008 and May 2013, we randomly selected five patients each at three different time points in their follow-up (3 months, 9 months, and >1 year after the operation). Thus, in total, 15 patients (7 males, median age=26 years, range=13–40 years; and 8 females, median age=30 years, range=17–57 years) were included in this study. The left eye was involved in 10 patients, and the right eye was involved in 5 patients. Before SMG transplantation, all 15 patients were diagnosed with severe KCS; they had obvious and persistent dry eye symptoms, and previous ophthalmologic treatment had been ineffective in these patients. During the postoperative follow-up, 13 transplanted glands showed sufficient and clear secretion. In these 13 patients, the symptoms of dry eye disappeared or were obviously relieved. In addition, the Schirmer test values increased, and measurements of tear film breakup time and corneal fluorescein staining showed that the ocular surface condition had improved (Table 1). However, two glands had recurrent swelling and produced only little and viscous secretion (Table 1); these patients were suspected to have developed chronic obstructive sialadenitis.

The secretory function of the submandibular glands was evaluated using ^{99m}Tc pertechnetate scintigraphy. The salivary uptake ratios and excretion fractions before and after surgery were calculated (Table 1).¹¹ Glands with abnormal secretion showed marked decrease in the pertechnetate excretion fraction.

All the transplanted SMGs in the study were vital, as confirmed by ^{99m}Tc scintigraphy. Transplanted SMGs with acute inflammation were excluded from the study.

Meglumine diatrizoate was used as a contrast medium and injected via a polyethylene tube (outside diameter, 0.6 mm; Becton, Dickinson and Company, Franklin Lakes, NJ, USA). Sialography was performed in an Orthopantomograph OP100 panoramic radiography unit (Instrumentarium Imaging, Tuusula, Finland).

III. THE SIALOGRAPHY PROCEDURE

The orifice of Wharton's duct in the upper conjunctival fornix was identified, and the duct was cannulated with approximately 3 cm of a polyethylene tube (Figure 1A). The

cannulation of Wharton's duct is a widely applied technique in SMG transplantation.^{5,6} Gentle massage of the gland usually rendered the orifice of the duct clear.

Meglumine diatrizoate was chosen as the radio-opaque agent, to avoid over-stagnation; as a water-soluble contrast medium, meglumine diatrizoate might be more easily discharged than an oil-based medium. Moreover, the long-term safety of meglumine diatrizoate for investigations of the eye has been confirmed.¹² Meglumine diatrizoate was injected into the transplanted gland via the tube (Figure 1B). Injection was terminated when a feeling of mild distension of the transplanted SMG was reported by the patient. The median dose of the contrast medium was 0.9 ml (range, 0.7–1.1 ml) in 11 patients who had the full-size transplanted SMGs. In the four patients who had undergone reduction surgery, as described by Geerling et al,² the injection doses were 0.4, 0.5, 0.5, and 0.5 ml. We required that the injection of an adequate dose of the contrast medium was indicated by the feeling of a mild swelling of the transplanted SMG.

Lateral and anteroposterior projections were applied immediately following the injection, using 77 kV and 16 mA (Figure 1C and D). The scan time was 0.5 s for the lateral projection and 0.8 s for the anteroposterior projection. The patients were then asked to do some exercises (climbing 6 flights of stairs) to help promote evacuation of the contrast medium, and projections were repeated 5, 7, and 10 min later to evaluate the excretory function of the transplanted SMG.

IV. SIALOGRAPHIC FINDINGS IN NORMAL TRANSPLANTED SMGS

Sialography was completed in all 15 study patients without any adverse reactions or severe discomfort. Normal transplanted SMGs appeared well filled with the contrast medium and were clearly visible on sialograms. The body of the gland was marked by an opacity and depiction of the secretory duct showed smooth walls and a regular shape (Figure 2). The median width and length of the main duct in lateral sialograms were 4 mm and 5 cm, respectively. The distal part of the main duct (between the lateral orbital wall and the ductal orifice) was demonstrated more clearly in anteroposterior sialograms than in lateral sialograms (Figure 2B).

The location of the gland body as well as the form of the main duct varied considerably depending on the surgical arrangement during transplantation, and the transplanted SMGs with reduction surgery showed typical changes on lateral sialograms. Only the remaining acini near the main duct was visible in these glands (Figure 2C).

Residual meglumine diatrizoate was visible at both 5 and 7 min after injection (Figure 3). The contrast medium was excreted completely from the transplanted SMG in 10 min, which is longer than that in normal parotid glands or nontransplanted SMGs. A possible explanation for this finding is that the capacity for saliva secretion declined after SMG transplantation.¹⁰

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