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Gland-preserving robotic surgery for benign submandibular gland tumours: a comparison between robotic and open techniques

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Abstract

Benign tumours of the submandibular gland are usually treated surgically. Gland-preserving techniques, which can be used to completely remove the tumour, preserve the function of the gland and reduce complications, but conventional open operations result in obvious scars on the neck. We aimed to investigate the feasibility and efficacy of gland-preserving robotic surgery using a hairline approach. We compared robotic with open techniques for gland-preserving operations to remove benign tumours of the submandibular gland. Patients were matched for age and sex (4 in each group). All patients in the robotic surgery group had their tumours removed successfully through hairline approaches. No patient had operative complications or postoperative functional nerve deficit, and an aesthetically pleasing outcome was achieved by concealing the scars within the hairline. Robotic operations took longer than open operations. No recurrence was noted during follow-up. Gland-preserving robotic surgery is a feasible alternative to conventional techniques and has potential advantages for safety and aesthetic outcome.

Keywords: Submandibular gland; Tumour; Robotic surgery; Aesthetic; Gland-preserving surgery

Introduction

Benign tumours and lesions of the submandibular gland are usually treated surgically,[1–4] and the gland is routinely removed with the tumour. Gland-preserving surgery is more conservative and the tumour is removed without sacrificing normal tissue, which is unnecessary in the case of most benign lesions.[5,6] Gland-preserving techniques have been reported to maintain oncological control, reduce operating time and surgical morbidity, and preserve function.[5,6]

Tumours of the submandibular gland are usually excised through a transcervical approach, which leaves a scar on the anterior neck that can be disfiguring if it becomes hypertrophic or generates keloid. For women, who are often diagnosed with pleomorphic adenoma when they are young or middle aged, a conspicuous cervical scar is not acceptable so the aesthetic outcome is an important consideration when tumours are removed completely. Many techniques have been developed to improve the aesthetic outcome, either through direct or endoscopic approaches,[2,7–12] but the operations can be difficult and take longer, and complications with insufflation make them unpopular. A small incision made for a retractor or to insert a stereoscope still leaves a scar on the anterior neck.

Use of robotic surgery has improved the aesthetic outcome of operations particularly in the head and neck, and several methods have been developed for tumours of the submandibular gland. Some reports have shown the feasibility

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of endorobotic surgery in animal and cadaver models,[7,13] but the incisions made to insert the trocar still resulted in scars on the anterior neck. Retroauricular or facelift approaches have been used in robotic operations for complete extirpation of the gland,[14,15] but the incisions are larger than those required for open operations, and visible scars are still left in the preauricular and postauricular areas.[14,15] These drawbacks mean that although current robotic techniques for operations on the gland can achieve a good aesthetic outcome, they are no less invasive. A conservative technique that uses a small incision is therefore appealing. We aimed to verify the feasibility and efficacy of gland-preserving robotic surgery for benign tumours of the submandibular gland.

Patients, materials, and methods

Patients

This is a prospective longitudinal cohort study of consecutive patients with benign tumours of the submandibular gland who were listed for robotic operations. Those who had a history of operations on the neck or irradiation, possible malignancy in the gland based on a preoperative evaluation, or a contraindication for operations or general anaesthesia, were excluded. At least one image, including sonography, computed tomography (CT), or magnetic resonance imaging (MRI), was done before operation. Fine needle aspiration or ultrasound-guided core biopsy examination was also done preoperatively to confirm the diagnosis.[16] When there were no contraindications in the preoperative evaluation, patients were listed for robotic resection. We compared them with patients matched for age and sex who were listed for gland-preserving open operations for tumours of the submandibular gland. Details of the patients were collected and compared. Functional tests before and after operation followed the standard protocol.[17] The mean time of follow-up was 12 months (9–15 months).

Operative preparation and instrumentation

Robotic resection of the tumour was done under general anaesthesia with the patient supine. An incision was made along the hairline from the mastoid tip (Fig. 1). Dissection at the subplatysmal level was done from the incision line towards the submandibular gland. The greater auricular nerve, sternocleidomastoid muscle, and surrounding structures were protected while the flap was created. When the submandibular gland was identified, the skin flap was raised with a retractor (Fig. 1). The da Vinci Surgical Robot (Intuitive Surgical, Sunnyvale, USA) was used for the operation with a 12 mm, 0° angled endoscopic camera. A 5 mm Maryland dissector and a 5 mm harmonic ACE® curved shears (Ethicon) were introduced through the incision. The endoscopic arm was introduced just beneath the retractor blade to provide a larger working space for the other 2 arms.

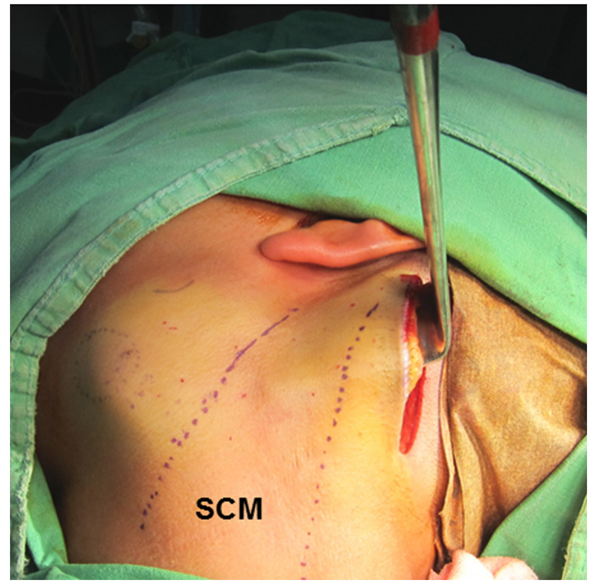

Fig. 1. Incision line created along the ipsilateral hairline. The skin flap was raised by a self-retractor to maintain the surgical tunnel. The location of the sternocleidomastoid muscle was marked on the skin.

Operative procedure

The robotic system was applied after the surgical tunnel was established. The gland was identified and the tumour dissected circumferentially from the surrounding tissue. This was done meticulously in an extracapsular fashion to ensure complete removal and prevent potential damage to the adjacent neurovascular structures (Fig. 2).[1,18] The marginal mandibular branch of the facial nerve was protected, and the facial artery and the facial vein were identified and retracted away from the dissecting plane. Vascular clips were used only if the vessels could not be retracted away from the surgical route. The surrounding nerves and normal glandular tissue were carefully preserved (Fig. 3). The specimen was then

Fig. 2. Robotic operation on a tumour in the submandibular gland. Its location in the posterior part of the gland was identified in the operative field. It was dissected circumferentially with a safe margin.