Case Report

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A case report of ansa cervicalis to spinal accessory transposition graft: a new surgical technique to prevent shoulder dysfunction

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Introduction and importance: The spinal accessory nerve is at risk when performing neck dissections for head and neck cancers. Injury to this nerve can result in shoulder syndrome, which can be challenging to manage. Various nerve repair or grafting methods are available to prevent this condition. A safe, simple, and cost-effective option is the ansa cervicalis to spinal accessory transposition graft.

Case presentation: A 60-year-old Afro-Trinidadian female presented to the Outpatient clinic for evaluation of a scalp lesion and a large neck mass for a duration of one year. Preoperative tissue biopsies confirmed she had squamous cell cancer with metastatic spread to the cervical nodes. The patient underwent surgical excision of the scalp lesion and left neck dissection with the sacrifice of the sternocleidomastoid and the left spinal accessory nerve due to tumour involvement. During the procedure, the ansa cervicalis was successfully joined to the distal remainder of the spinal accessory nerve. After the surgery, the patient fully recovered and achieved a good quality of life during the 24-month follow-up.

Clinical discussion: This is the first reported case of using the ansa cervicalis to reinnervate the trapezius muscle through the spinal accessory nerve. This procedure aims to prevent pain, muscle wasting, and adhesive capsulitis. A quality-of-life questionnaire and adequate range of motion proved the success of this procedure, demonstrating that this option provides practical, functional, and aesthetic benefits for patients.

Conclusion The ansa cervicalis to spinal accessory transposition nerve graft is a valuable option for reinnervation. This case report highlights the effectiveness of this single-stage procedure in preventing shoulder syndrome.

Keywords: ansa cervicalis, case report, nerve repair, shoulder dysfunction, shoulder syndrome, spinal accessory nerve

Introduction

The management of head and neck cancers typically involves surgical removal of the primary tumour, followed by a neck dissection and chemoradiation[1]. In the past, this was done through radical neck dissections, which involved removing all lymph nodes as well as three vital structures: the spinal accessory nerve (SAN), the sternocleidomastoid muscle (SCM), and the internal jugular vein (IJV)[2]. However, this approach led to complications, particularly damage to the SAN. As a result, the trapezius muscle would atrophy, leading to shoulder syndrome, which causes pain, weakness, drooping, and reduced range of motion[3–5].

HIGHLIGHTS

- The spinal accessory nerve is at risk when performing neck dissections for head and neck cancers.
- When injured, the trapezius muscle atrophies leading to subsequent shoulder syndrome: pain, weakness, shoulder drooping, and decreased range of motion.
- Prevention can be achieved by an ansa cervicalis to spinal accessory transposition nerve graft: a simple and novel technique.

It is important to preserve the SAN whenever possible to prevent complications. If the nerve has to be sacrificed due to tumour infiltration or inadvertent injury, various repair techniques can be implemented. At a tertiary teaching hospital, we have successfully transposed the ansa cervicalis to the spinal accessory nerve during a modified radical neck dissection, which, to our knowledge, is the first successful case. This case report has been reported in accordance with the Surgical CAse REport (SCARE) 2023 criteria[6].

Case presentation

A 60-year-old Afro-Trinidadian female was referred to the ENT outpatient clinic from the Plastic Surgery unit for the joint

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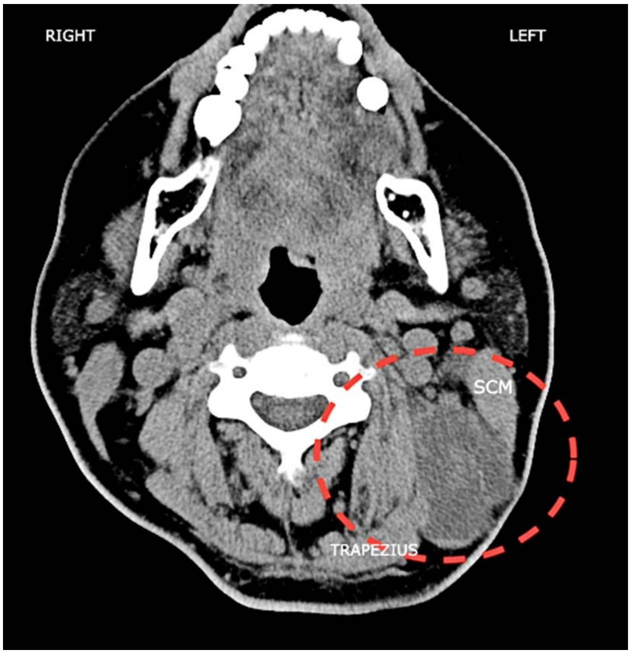

Figure 1. Computed tomography scan showing the left-sided neck mass (red circle) abutting the sternocleidomastoid (SCM) muscle.

management of a lesion on her left parietal scalp and a left-sided neck mass. The scalp lesion was present for the past year, whereas a small palpable left-sided neck mass was first noted six months ago. Both lesions rapidly increased in size over the last few months. The patient denies alcohol and tobacco use. She is a retired caregiver and is right-hand dominant. She had no other illnesses and appeared to be physically well, with an Eastern Cooperative Oncology Group (ECOG) score of one.

On examination, there was a non-healing scalp ulcer, which measured 6 × 8 cm. The accompanying left neck mass was located in levels II, III, and V, measuring 6 × 5 cm. The computed tomography (CT) scan showed multiple left cervical lymph nodes, the most extensive measuring 6.8 × 5.1 cm, with no distant metastases (Fig. 1). A punch biopsy of the ulcer confirmed squamous cell cancer of the scalp, and a fine needle aspiration cytology of the neck node showed the presence of metastatic malignant squamous cells.

The patient's case was discussed at a multidisciplinary team meeting. Primary surgical removal of the tumour followed by a modified radical neck dissection was planned. The patient was thoroughly informed and gave their consent for the procedure. During general anaesthesia, the plastic surgical team removed the scalp lesion, and the ENT team proceeded with a left modified radical neck dissection. The team found that the lesion in the neck involved the left SAN and sternocleidomastoid muscle, which had to be removed. However, they managed to preserve the internal jugular vein. The distal end of SAN was divided 2 cm from the mass, and the frozen section confirmed clear margins. Although the proximal end could not be positively identified, it was assumed to be near the base of the skull. Therefore, the team made an intraoperative decision to use the ansa cervicalis as a transpositional nerve graft.

Surgical technique

The anterior belly of the omohyoid muscle was cut to expose the ansa cervicalis nerve, which is located deep to the muscle. The muscle crosses the carotid sheath from posteroinferior to anterosuperior to attach to the hyoid bone. The nerve was identified, coursing downward at the anteromedial border of the carotid

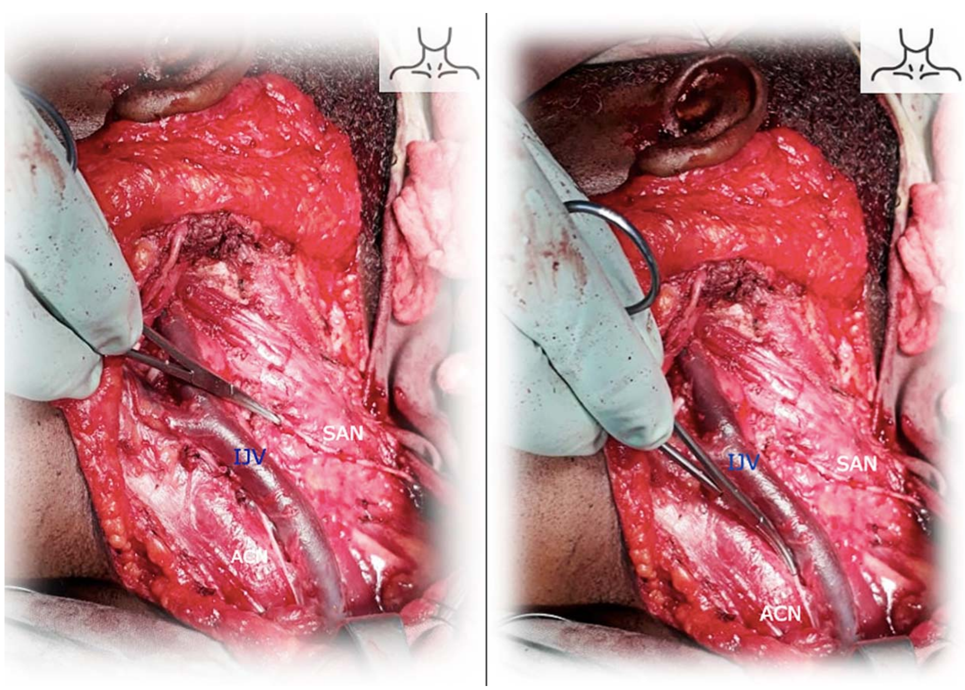

Figure 2. Intraoperative view of the distal spinal accessory nerve (SAN) and ansa cervicalis nerve (ACN). IJV, internal jugular vein.

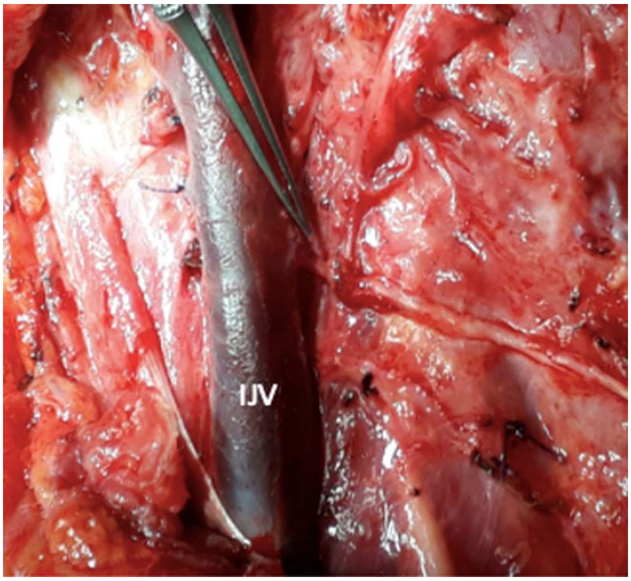

Figure 3. This image shows the end-to-end anastomosis of the ansa cervicalis nerve to the distal end of the spinal accessory nerve with an autologous vein graft tuberization (forceps tip). IJV, internal jugular vein.

sheath's mid-to-lower third. To achieve maximum length, the ansa cervicalis nerve (ACN) was traced and transected close to its insertion into the infrahyoid strap muscles (Fig. 2). The ACN was passed medial to the IJV to lie in the posterior triangle of the neck, where it was anastomosed to the distal spinal accessory nerve (Fig. 3). This was done using a 9-0 prolene suture under microscopic vision. A vein conduit, which consisted of a short segment of the anterior jugular vein, was used to protect the repair.

Outcome

The postoperative period was uneventful. On day 6, the patient started a targeted physiotherapy program consisting of passive and active shoulder movement exercises and strengthening exercises. The patient began adjunct chemotherapy and radiation treatment at 3 weeks postoperative for a duration of 6 weeks. She was followed up at 1 month, 3e months, 6 months, 12 months, and 24 months following surgery. There were no signs of recurrent disease. The patient recorded a steady improvement in function with minimal hindrance in her quality of life, as proven by using questionnaires. Nerve conduction studies were not available. However, an adequate range of motion during objective muscle testing was noted. She achieved a maximum shoulder abduction angle of 135 degrees (Fig. 4).

Discussion

The incidence of SAN injury after surgery is relatively high, ranging from 33 to 66%[7]. These injuries are usually related to neck dissection surgery but can also occur after lymph node biopsies in the neck's posterior triangle[8]. Blunt or penetrating injuries to this region can also lead to such injuries, resulting in trapezius muscle weakness and shoulder dysfunction[9,10].

Shoulder syndrome, first documented by Nahum in 1961, is characterized by joint pain, limited active range of motion in the shoulder joint, particularly during abduction, and complete passive range of movements with apparent physical deformities around the shoulder. These findings are accompanied by abnormal EMG testing without radiographic abnormalities[11]. Szunyogh and colleagues conducted a review of patients who had difficulty using their shoulders after undergoing radical neck dissection. They concluded that this difficulty was caused by weakness in the trapezius muscle[12]. These patients typically have an uneven neckline due to wasting of the SCM and trapezius muscles. Unfortunately, diagnosing this condition can be complicated and may be missed by a doctor. However, passive and active range of motion (ROM) and muscle power testing can help diagnose. These tests involve measuring arm abduction using a standard goniometer and an inclinometer. The results are then graded based on the Louisiana State University Health Science Centre (LSUHSC) grading system[10]. Nevertheless, the most sensitive approach for diagnosis is objective electrodiagnostic testing (EMG)[13].

There are several questionnaires that can evaluate a patient's quality of life by assessing their functional scores. These scores can help determine the best management for the patient and their prognosis after surgery. One of these questionnaires is the Shoulder Disability Questionnaire (SDQ), which is a subjective 16-item questionnaire that the patient answers about their day-to-day symptoms and function. The questionnaire is ranked from 0 to 100, with higher scores indicating reduced function[14]. Other validated questionnaires include the Disability of Arm, Shoulder and Hand (DASH) score and Neck Dissection

Figure 4. This is a photo of the indexed patient 12 months after surgery and chemoradiation. She displays a left shoulder abduction angle of 135° with great effort.

Table 1

Comparison of the different nerve repair techniques and their outcomes.

Donor nerve	ROM	Surgical complexity[a]	LSUHSC Grade
Medial pectoral nerve	110°	Intermediate	3
Lateral pectoral nerve	160°	Major or complex	5
Posterior division of upper trunk of brachial plexus	151°	Major or complex	5
Ansa cervicalis	135°	Intermediate	4

LSUHSC, Louisiana State University Health Science Centre; ROM, range of motion.
[a]Adapted from the NICE guidelines.

Impairment Index (NDII)[15,16]. In our patient's case, they scored an average of 35 out of 100 and 30 out of 100 in all the questionnaires postoperatively after the 1st year and 2nd year, respectively.

To avoid shoulder syndrome and maintain trapezius function it is crucial to preserve the SAN during the neck dissection or restore its function if damaged. A comprehensive understanding of the SAN anatomy is essential to avoid unwanted injury during less radical procedures. In case of damage or planned sacrifice, various repair options are available, including immediate primary repair, cable grafting, and nerve transfer[10,17–20]. Several motor nerves are close to the SAN. These nerves include branches of the brachial plexus, originating from the lateral neck and extending towards the upper limbs. One of the earliest methods for treating SAN injury involves using the medial pectoral nerve, which has been found to result in a range of motion of up to 110°[18]. Another method involves the anastomosis of the lateral pectoral nerve with the distal SAN through a supraclavicular incision. This technique has improved shoulder stability and function and achieved a range of motion of up to 160°[21].

There are other options available for treating SAN injuries in the neck, such as transferring the posterior division of the upper trunk of the brachial plexus to the distal portion of the SAN. This method has shown promising results for most patients, with a ROM of 151°[22]. The upper trunk fibres of the brachial plexus are the same as those of the axillary nerve, which is responsible for supplying the deltoid muscle that helps elevate the shoulder. As a result, rehabilitation and retraining of the trapezius muscle is much easier using this technique compared to other methods[23].

Although the techniques discussed above offer excellent outcomes, they are technically challenging and often performed only in centres with experienced surgeons. For this reason, the ansa cervicalis transposition graft provides an alternative option. It is a commonly encountered nerve that can be easily harvested during neck dissections, adds little to the surgical time, and carries low donor site morbidity. Another potential indication would be for patients with acute neck trauma with resultant transection, and the proximal accessory nerve may be difficult to identify. However, one notable limitation of this method is that the improved power, stability, and range of motion achieved are less impressive than the other techniques discussed due to a donor-to-recipient nerve size mismatch, Table 1.

The SAN contains 1500–3000 myelinated motor fibres, whereas the ACN contains much less, affecting its neural capacity to stimulate the entire trapezius muscle. As a result, the objective of this technique is not to restore full function but to prevent atrophy, pain, and debilitating adhesive capsulitis. Other limitations include the need for a long SAN stump (at least 6 cm) and the challenge of accessing the graft when the SCM is present. Additionally, radiation to the surgical site may have had a negative impact on nerve regeneration.

Rehabilitation is crucial for patients, and physiotherapy is especially important in cases where the nerve has been repaired[24,25]. The exercises prescribed in physiotherapy can prevent shoulder pain and limitations in motion and ultimately improve the patient's overall quality of life[4].

Conclusion

The associated shoulder disabilities resulting from SAN injury after neck dissection are well documented, with alarmingly high incidence rates. To prevent total shoulder dysfunction in cases where the SAN must be removed due to tumour involvement or in cases of acute traumatic transection, we propose a new technique called ansa cervicalis transposition nerve graft.

Ethical approval

Not applicable.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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No funding was required or received for this research.

Author contribution

L.M.N.: study concept, design, research, writing the paper. S.C. M.: supervisor. S.J.: supervisor, editor.

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There are no conflicts of interest.

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Not applicable.

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