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Iatrogenic Accessory Nerve Palsy after Laterocervical Lymph Node Biopsy–Clinico-Surgical Considerations on 42 Cases and Review of the Literature

Stefano Ferraresi, Elisabetta Basso, Maria Angela Pino and Piero Dipasquale*

Department of Neurosurgery, Ospedale di Perugia - Santa Maria della Misericordia, Rovigo, Italy

Abstract

Aim of the Authors is to cast a light on a very severe iatrogenic injury, with long-lasting and potentially devastating consequences for the victims and a very low level of awareness among the general surgeons, who are usually the actors of the damage. The main features of the typically involved patients, their clinical presentation and theresults obtainable after surgeryand rehabilitation are investigated at light ofthe timing of injury and the type of repair.

Keywords: Iatrogenic injury; Posterior cervical triangle; Spinal accessory nerve

Introduction

Thespinal accessory nerve (SAN) is involved in the thoracoscapular physiology and essential for the complex function of the shoulder [1,2]. It innervates a powerful and widely implanted muscle, the trapezius, the integrity of which is essential to have a stable scapula, inasmuch it ensures the scapulohumeral rhythm in synergic function with the serratus anterior muscle. The stabilization of the scapula is roughly divided into a lower stabilizer, the serratus anterior muscle and an upper stabilizer, the trapezius. Its proximal insertions make possible the full action of the supraspinatus muscle which results in complete abduction. This last movement is lost after a complete accessory nerve injury [3-8].

Iatrogenic causes play a consistent role in SAN injuries, and are mainly due to a radical neck dissection when complete tumour clearance is desired.

However, this paper focuses on a very particular subset of these injuries, namely thoseoccurring in course of lymph node biopsy in the posterior triangleof the neck [1-9]. This damage is peculiar because unintentionally overlooked [11] and easily avoidable with an accurate surgical preparation and selection[10]. The literature is full of reports focusing on the severity [12-15] of this unfortunate event and unexpectedly large series witness the relative ease with which this kind of injury happens [16,17].

Patients and Methods

Between 1996 and 2014, forty-two patients came to our attention for iatrogenic accessory nerve palsy due to a surgical biopsy in the posterior triangle of the neck, after the emission of the branch for the sternocleidomastoid muscle.

The age ranged from 18 to 62 years and the male to female ratio was 1: 1.6.

The biopsy, for the majority of them (39/42), was done in local anesthesia.

In 4 cases a diagnosis of lymphoma ensued, in two cases atubercolous chronic infection was present, but in 36 cases the biopsy was either not conclusive or related to a minor a specific viral infection, so being such an injury not warranted at the end (Table 1).

Ten patients, at time of the first observation, had an incomplete lesion and were simply encouraged to wait for a full recovery. Among these, neuropathic pain was moderate if ever present.

In the remaining 32 complete palsies, 8 patients were referred to us very lately, more than 18 months from the time of injury (Table 2).

Thirty patients only had nerve surgery at the end while two of the very late presentations (more

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Correspondence:
Stefano Ferraresi, Department of Neurosurgery, Ospedale di Perugia - Santa Maria della Misericordia, Rovigo, Italy,
E-mail: steveferraresi@gmail.com

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Table 1: Diagnostic values of the biopsy.

SAN injury after lymph node biopsy	lymphoma	Generic not conclusive	Tuberculous granulomas
42	4	36	2

Table 2: Clinical presentation at the onset.

Complete trapezius palsy	Partial trapezius palsy	Late referral >18 months
32*	10	8*/32 (complete lesions)

*Late referrals were in the complete group.

Table 3: Findings at nerve surgery.

Total number	Neurolysis	Direct suture	Graft repair	No repair
30 had nerve surgery	4 (2 silk ligatures, 2 thermal injury)	8	16 (in 4 cases the surgeon was not convinced of the correspondence of the stumps)	2§ (absence of the distal stump)
2 very late cases had muscletransfer only				

Table 4: Source of the grafts.

Graft repair	Greater auricular	Sural nerve	Vein graft	Neural tube
16°	8	5	1	2

°In 4 cases a graft was performed but the mismatch in caliber between proximaland distal stumps suggested a lack of correspondence between the two nerves (sensory versus motor). Despite the heavy perplexity of the senior surgeon (F.S) no better solution was found and the sutures were completed.

than two years afterinjury-Table 2) had instead a pure secondary surgery according to Numanoglu and Rode [18].

Out of them, four cases (4/30) required a simple neurolysis: in two casesa silk ligature was found but after its removal the accessory nerve was found in continuity. The other two had scarred nerves probably related to thermal injury (Table 3).

The surgical approach consisted in a two-flap extension of the original incision, which is usually quite small. The exposure is designed to identify the proximal stump of the SAN, where it turns behind the sternocleidomastoid muscle, and encompassesthe middle thirdof the trapezius muscle in its anterior border,half-way from the tip of the mastoid to its anterior insertion on the clavicle. The anterior border of the trapezius may be heavily scarred and the soft tissue/musculofascial interface may be not so readily recognizable. The use of magnifying loupes is strongly recommended because the dissection may take considerable time as the surgeon distinguishes the cervical plexus and other sensory branches to the skin of the neck and the periaural regions. The deeper dissection may bepainstaking and eventual intramuscular motor branches are very short and easily missed with the bare eye. Thedifficult task, depending on how extensive and awkward was the dissection during the former surgery, is the identification ofthe distal motor branches in the trapezius [19]. This is especially important where a consistent length of the SAN has been respected at the time of lymph node removal. If, at the beginning of surgery, one can be confident regarding the possibility to find the proximal stump, which runs between the sternomastoid and cleidomastoid bellies of the SCM, not the same can be expected for the distal stump, because at times this results into an impossible task (Figure 1A-1C). In two of our patients it was not possible, and sohappened in other cases described elsewhere [20]. Only after identification and coaptation of the proximal and distal stumps, the microscope isbrought into the field and the suture is done with one or two 9-0 stitches and fibrin glue.

After mobilization, if the proximal and distal stumps can be brought together without significant tension (Figure 2A), then a direct anastomosis is the choice and thishappened in 8/30 cases (25%).

In the other cases a graft procedure was required (Figure 3A). The great part was carried out with local nerves (greater auricular), while

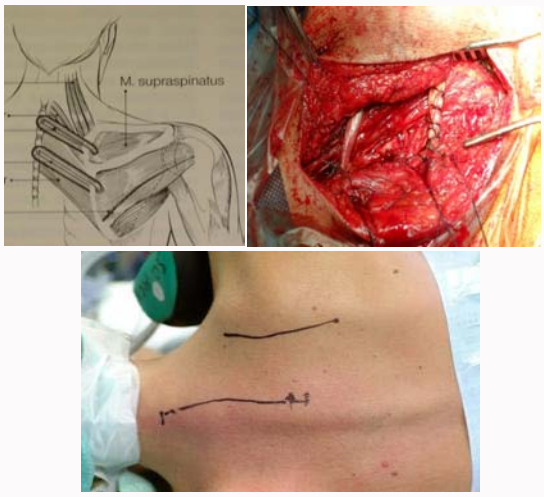

Figure 1(a-c): The Henry procedure (draft, surgical field and preoperative planning).

less often a sural graft was harvested (Table 4).

When the final gap was short (about 1 cm) a segment of vein stuffed with muscle (one case), or a neural tube (Neuragen – two cases) could be used.

Selection of grafts

Finding a local graft, namely a branch of the greater auricular nerve, is a clear advantage over the sural graft. This because we would be dealing with another incision and, moreover, because the harvest of a small sural nerve graft exposes the patient to a high incidence of painful neuroma. This because the proximal stump, after a short graft, would lie immediately under the skin, over the fascial compartment.

When more graft material is harvested, on the contrary, the proximal stump lies deep in the calf, normally buried within the muscle. In this way the neuroma formation is very unlikely to be a source of pain.

Forthe sake of precision, we haveto remark how, from time to time, also the local nerves are source of complaints. In fact, occasional patients refer of a painful and annoying sensation in the infra and

Figure 2: A) A direct suture is feasible. B) Same patient. Note the deformity of the shoulder muscles and the levator scapulae in relief like a tense strand.

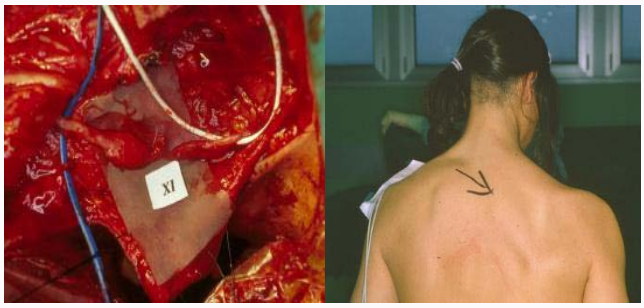

Figure 3: A) Nerve interruption with neuroma. After resection a graft will be required. B) Same patient: note the striking atrophy of the trapezius muscle.

retroauricolar area, although this probably is more related to the original damagethan as a result of their use as a graft.

Results

As expected, none of the patients where the intraoperative impressionhad been unfavorable (4 cases), showed a useful result. This, coupled with the two patients in whom the distal stumps were not found, enhances the cohort of patients with a complete failure. Excluding the obvious good results obtained by neurolysis (4 cases, Table 3), the final results of nerve repair are burdened by a 9/26 (35%) of M0 score. The patients with neural tubes and the vein graftscored M0.

This last result could have been originally biased by thesenior surgeon (SF). In fact, in three very late cases, a "second choice material" such as the neural tubes and the vein graft were intentionally chosen to avoid a sural nerve graft in patients deemed to have a very low potential of regeneration, because of the exceedingly long time elapsed.

Thevery high percentage of bad results (35%), which differs from what reported in other papers [21-23], may so find a reliable explanation.

Nevertheless, as already stated, a constant difficulty comes from finding useful distal motor branches at the anterior border of the trapezius, and this especially when the first surgery has entailed a heavy scarring of the area.

Of the other cases, 13/17 had a very good result (trapezius scoring M3 or more) so configuring an overall l50% of good results after this kind of surgery.

One clear advantage, in the patients receiving a nerve repair, is the disappearance of neuropathic pain, so suggesting a role of the proximal stump in the pain symptoms.

Figure 4: A) Note the exceedingly small scar of the first surgery. B) Same patient after reconstructive surgery: excellent result.

At muscular effort and endurance, however, only those who had an excellent to good BMC score (M3 and M4) experienced a significant improvement in shoulder pain and function. A full restoration to normal was described mainly among those having eithera spontaneous recovery orafter surgery with neurolysis.

Discussion

Some important considerations emerge from the analysis of our cases and namely:

a. Local anesthesia, and the consequent obvious lack of curarization, does not protect from iatrogenic injury. The only difference is that usually the patient experiences a sharp pain during the removal of the lymph node. As a matter of fact, in the iatrogenic cases of our series, the nerve stimulator was never used.

b. Those patients operated in general anesthesia feel much more postoperative pain than expected, and keeping the arm at rest, as it is normally advised, they delay the possibility of an immediate diagnosis and repair, which would be the ideal situation.

c. The vast majority of patients present severe pain and devastating muscle atrophy which, in turn, prompts a very particular postural attitude, with hyperactivity of the levator scapulae and striking atrophy of the shoulder(Figure 2B and 3B).

d. The patients showing a deficit of the trapezius muscle are almost always addressed to rehabilitation therapy which, however, very rarely has been of help in making the correct diagnosis. On the opposite, asking for severe endeavour of the periscapular muscles, it significantly contributes to increase pain and disability.

e. For the overmentioned reasons, the vast majority of our patients attain a very late diagnosis, the majority of them between 5 to 8 monthsfrom the offending event.

f. The early recovery of some activity in the trapezius muscle is a good prognosticsign. We have a consistent number of patients who recovered very wellwithout surgery.

g. Generally speaking, one should not start surgery planning a neurolysis, since those cases having a continuity of the nerve are generally deemed to have a spontaneous recovery. However, on some occasions, the pain is overwhelming and in these casesaneurolysis is warranted. A strong ligature around the nerve or other type of persistent damage, in fact, can well sustain the neuropathic pain (Figure 4A and 4B).

h. If the patient shows no recovery at EMG at 3-6 months or if he/she has excruciating pain, is addressed to surgery: usually a nerve section is found although from time to time (severe scarring, silk

ligatures around the nerve) a simple neurolysis is all what is needed and the immediate postoperative effect is striking.

i. The surgical exploration generally is followed either by a direct repair or by a 3 cm graft: this depends on the pathologic anatomy and not from the time interval between injury and repair.

j. After surgical repair all the patients have experienced a clear improvement in the pain around the shoulder, with the only exception of those in whom the distal stump is not found, the proximal stump developing a neuroma. A possible role of the proximal stump of the accessory nerve seems so to be involved in the genesis of neuropathic pain.

k. A nerve repair is certainly worth in the majority of cases. However only slightly more than 50% of the whole group of patients experiences a long term recovery ofshoulder function and less muscle atrophy.

l. Afull restoration to normal has been principally observed in the group who had neurolysis.

m. We have not clearly defined a time limit to perform or not the repair, but the results of a nerve repair done later than 18 months after iatrogenic injury stronglyfavour a secondary surgery such the Eden-Lange [24] modified by Bigliani [6] or the Henry/Szubinskj as first-time procedures [25-30].

n. People undergoing successful secondary procedures, however, are less free of pain than those having successful nerve repair, this further confirming an intrinsic cause of neuropathic pain in the posterior cervical area.

Conclusion

This nerve ishighly vulnerable along its superficial course. This study confirms how very commonly the diagnosis of this iatropathic injury goes unnoticed for a long time before diagnosis andmanagement are instituted.

Nerve exploration is certainly worth but for several reasons the recovery after nerve repair is not complete in all the patients, reaching roughly only the half of them.

Recognition and referral are seldom, if ever, made by the surgeon responsible for the injury, leading to a marked delay in treatment. From examination of our records, 42 patients with lesions of the spinal accessory nerve due to lymph node biopsy have on average an 8 months delay between iatrogenic damage and referral.

Most diagnoses were due to unexplained pain and loss of shoulder function while only secondarily because of the deformity in the shoulder attitude.

The clinical picture is obvious. There is a characteristic downward and lateral displacement of the scapula, with narrowing of the inferior scapulohumeral angle and loss of function, with severe pain commonly present.

The course of the nerve in relation to the sternocleidomastoid muscle is constant and damage to the spinal accessory nerve is usuallydistal to the branch for this muscle in the so-called posterior triangle of the neck (PCT).

Despite the delay, the results of repair are surprising especiallyconcerningearly relief of pain, implying a neuropathic source which even precedes the recovery of muscle function.

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