CASE REPORT :

Neurologic lesion following a Latarjet procedure performed under interscalene brachial plexus block and general anesthesia

SCHMITZ Marylin
MACCS 2nd year Anesthesia - Reanimation
Mars 2015

OBSERVATION

A 48 year-old woman, American Society of Anesthesiologist risk classification 1, was referred for a surgical intervention on her left shoulder. The patient complained of recurrent anterior dislocation, which was affecting her daily life. The arthrography showed stigma of anterior recurrent dislocation and fracture of the anterior-inferior humeral glenoid referred to as Hill Sach lesion. Latarjet procedure was suggested by the surgeon.

Patient's past medical history was unremarkable except for a partial brachial plexus injury on the left side after plastic breast surgery in 1990, resulting in a major deltoid and biceps denervation. Examination upon current admission did not evidence any sequels from this partial plexus lesion.

The anesthesia strategy consisted in an association of loco-regional and general anesthesia.

A pre-operative inter-scalene block without catheter placement was performed using a lateral approach. The inter-scalene brachial plexus was identified by ultrasonography and neurostimulation was used to confirm the right position of the stimpulex 5cm needle. Twenty mL of 0.25 % bupivacaïne containing 1/200000 epinephrine and 75 µg of clonidine was injected. The procedure was performed under sonographic control to confirm the diffusion of the solution around the C5-C6 nerve roots. This inter-scalene block was easy to perform in this patient who had a simple sonoanatomy. There was no pain, dysesthesia, or paresthesia during the procedure.

Twenty minutes after the injection, a complete sensorimotor block of the left arm was noted.

Next, general anesthesia was induced with 5 µg of sufentanyl, 150 mg of propofol and 40 mg of rocuronium. Maintenance of anesthesia was ensured by desflurane. The patient was placed in the semi-sitting position, with the head in neutral position, during the 3-hour surgery. The procedure was described as uneventful by the surgeon.

Post-operative analgesia was ensured by the one shot inter-scalene brachial plexus block and an intravenous patient-controlled pyritramide analgesia, which the patient didn't really use. Patient stayed comfortable during the first 24 post-operative hours. The arm was maintained in a splint.

At 36 hours, mobilization of the shoulder was possible, clinical examination revealing a persistent motor block in the left hand and in the 5 fingers, which corresponded to a lesion of the C5-C8 nerve roots. Mobilization from the elbow was also limited. Hypoesthesia in the whole territory was also noted, but no pain.

An ultrasound examination of the left brachial plexus was performed, and allowed excluding a compressive process.

Magnetic resonance imaging also excluded a compressive process on the brachial plexus. It only showed a serohemorrhagic effusion within the surgical site.

A neurophysiologic exam was performed on the second post-operative day, and showed an acute lesion of the inferior and middle part of the brachial plexus. There were no signs of denervation. On post-operative day 21, another neurophysiologic exam revealed a global lesion from C6-C8/T1.

Given the history of partial brachial plexus lesion in the past, a DNA analysis was requested to exclude a genetic predisposition to the development of neuropathic lesions such as CMT 1A (Charcot Marie Tooth type 1) or tomacular neuropathy. The analysis didn't find any molecular argument for those genetic anomalies.

The treatment proposed to this patient consisted on Vit B, physiotherapy 3 times a week, and Rivotril 2-3 times a day if necessary.

Three months after the surgical intervention, muscle strength recovered, with still a persistent dysesthesia in the fingertips. The neurophysiologic exam showed a discrete chronic sequel radiculopathy (C6-C8/T1)

DISCUSSION

The inter-scalene brachial (ISB) plexus block is an effective and secure method to achieve analgesia in shoulder surgery.

As reported by Kenneth et al., long-term severe neurologic defects such as neuropathy after inter-scalene brachial plexus are uncommon with a reported incidence of 2.9/10000, whereas transient neurologic sequels such as paresthesia, dysesthesia or pain related to surgery occur more frequently. (1)

A study from Sviggum and al. reported a reduction of neurologic lesions after total shoulder prosthesis surgery when it was performed under general anesthesia associated with ISB plexus block. They consider the ISB plexus block as a protection factor against neurologic lesions. (2)

Sixteen percent of neurologic complications after loco-regional anesthesia (LRA) can be directly attributed to LRA as compared to 84% that can be attributed to surgery. (3)

Physiopathology

In case of persistent paresthesia, dysesthesia, or pain not related to surgery in a patient who underwent an ISB plexus block, the sulcus ulnaris syndrome, carpal tunnel syndrome, and the complex regional pain syndrome should be excluded, because specific treatment may be required. (4)

In case of functional loss of the upper extremity after an ISB plexus block performed for a shoulder surgery, 4 physio-pathologic mechanisms must be considered: mechanical injury, ischemic, inflammatory and chemical lesion.

Mechanisms of injury most of the time include lesions due to prolonged intra-operative malposition, compression by hematoma or surgical tools, but also ischemia secondary to hemodynamic instability or altered hematosis, direct nerve injury due to the needle or the catheter, intra-neural injection of local anesthetic agents, neurotoxicity of local anesthetic, ... (5)

The toxicity of local anesthetic agents is proportional to the quantity of drugs administered. The cervical region is richly vascularized, and local anesthetic agent resorption is so high that local toxicity in this region is rarely responsible for neurologic lesions. (6)

Local inflammation around the site of injection can also be responsible for neurologic symptoms but they usually regress within 2 weeks. The more performing plexus anesthesia is laborious, the more subsequent local inflammation is probable. (8)

Principles of management of a patient with suspected neurologic lesion?

In a patient with abnormal block length, it is worth reporting the incident and pursuing a diagnostic approach to find out the etiology.

The initial assessment consists in reviewing LRA protocol. Important things to review are the different steps of the LRA procedure (type of needle, insertion of a catheter, use of neuro-stimulation, injection of local anesthetic agents,...), ultrasound guidance (spotting the nervous structures, visualization of the needle extremity, dynamic of injection of local anesthetic agents,...), total injected dose of local anesthetic agents, efficacy of LRA during surgery, and use of sedation during settling of LRA or not. (7)

The next step includes history, physical exam, and several additional tests.

The history is important in identifying prior medical conditions, such as neurological diseases, diabetes, alcoholism, or chemotherapy, and to describe the chronology of symptoms.

A neurological consult is recommended to explore the neurological defects.

Physical exam is important to define the topography of the neurological defects, sensory and motor components of the lesion, and to evaluate deep tendon reflexes. A bilateral and comparative exam is important.

Magnetic resonance is actually the more performant examination, which permits to localize the lesion, define its extension, and give an idea about its etiology (e.g. compressive hematoma, nerve trunk edema, ischemic lesion, osteosynthesis dislocation, compression by bone fragments/splinter ...)

When magnetic resonance is not immediately available, ultrasound evaluation and CT scan can be useful. (8, 9)

Electromyography allows evaluating a peripheral neurological lesion. Somatosensory evoked potentials explore medullar and radicular lesions, and motor evoked potentials explore the pyramidal tract and motor roots. Combining those three tests allows making the difference between preexistent lesions, denervation, assessing topography accurately, and evaluating lesion severity. Early neurophysiologic assessment, at day 3-5, can be done to exclude preexistent unknown neuropathy, and later assessments are to be performed at day 15, 6 weeks and 3 months.

During these diagnostic procedures, it is important to clearly explain to the patient his/her symptoms, and manage the emotional trauma.

In the present case, the forum from SOS-ALR also guided us through the diagnostic approach.

Comment [BV1]: What is this ? Please describe.

Treatment

Functional reeducation and physiotherapy are necessary to reduce contracture, muscular atrophy, and prolonged invalidity.

Some medications can also be used for the treatment of neurological lesions after LRA. Examples found in the literature are imipramine (tricyclic antidepressant), paroxetine (selective serotonin and norepinephrin re-uptake inhibitor), and pregabaline/gabapentine.

Drug choice has to be discussed with a neurologist and depends on the somatic and psychiatric background, eventual contraindications, and drugs interactions. (11)

CONCLUSION

In the present case, the diagnostic process came to the conclusion of wrong positioning of the patient during surgery, or stretching lesion as the most likely cause of the observed neurological defects.

Most of the time, the neurologic deficit is not caused by locoregional anesthesia but results from surgical trauma or malposition during surgery.

Neurologic defects after loco-regional anesthesia, when caused by the anesthesiologist, do not mostly concern the whole plexus, but rather single nerve roots.

The risk of neuropathy after peripheral locoregional anesthesia must constantly be kept in mind and should prompt us to always make the balance between eventual advantages and risks before performing a block. Locoregional anesthesia is an invasive procedure, not deprived of significant risk.

ISB plexus block seems to offer protection for shoulder surgery.

Performing peripheral locoregional anesthesia under sonographic guidance is recommended. Sonographic guidance may reduce the incidence of neurologic complications, but this point has to be confirmed by future studies. (10)

Factors increasing the odds of developing neurological sequels are paresthesia at needle location and pain at the ISB site.

A detailed protocol of the peripheral locoregional anesthesia technique should always be written, and will be reviewed in case of post-operative neuropathy.

A systematic management is necessary in case of neurological lesions, so as to define the etiology, and start the right treatment as soon as possible. Magnetic resonance imaging is actually one of the most performant examinations to find out the exact etiology.

BIBLIOGRAPHY:

1. Candido, K. ; Sukhani, R. ; Doty, R. ; Nader, A. ; Kendall, M. ; Yaghmour, E. ; Kataria, T. & McCarthy, R. (2005). Neurologic sequelae after interscalene brachial plexus block for shoulder/upper arm surgery: the association of patient, anesthetic, and surgical factors to the incidence and clinical course. *Anesthesia Analgesia.* 100(5):1489-95.

2. Sviggum, H.; Jacob, A.; Mantilla, C.; Schroeder,D.; Sperling,J. & Hebl,J. (2012). Perioperative nerve injury after total shoulder arthroplasty : assessment of risk after regional anesthesia. *Reg. Anesth. Pain. Med.* 37 : p. 390-394

3. Mahiou, P. (2013) *Plainte de neuropathies.* En ligne : "http://www.assproscientifique.fr/actualites/asspro/communications"

4.Borgeat, A. ; Ekatodramis,G. ; Kalberer, F. & Benz.C. (2001). Acute and Nonacute complications associated with interscalene block and shoulder surgery. - A prospective study. *Anesthesiology.* 95 : 875-880

5. Dullenkopf,A. ; Zingg, P. ; Curt, A. & Borgeat,A. (2002). Funktionsverlust der oberen Extrmität nach Bankart-Schulteroperation unter Interscalenus-Blockade und Allgemeinanästhesie. *Der Anaesthesist.* 51: p547-551. DOI 10.1007/s00101-002-0331-8

6. Gaertner,E. (2014). *Bloc interscalénique du plexus brachial*. En ligne : " http://www.i-alr.com/index.php/espace-professionels/techniques/blocs-peripheriques/membre-superieur/407-bloc-interscalenique-du-plexus-brachial"

7. Mahiou, P. (2013) *Plainte de neuropathies.* En ligne : "http://www.assproscientifique.fr/actualites/asspro/communications"

8. Zetlaoui,P.(2015) Complications neurologiques après ALR périphérique. *Congrès JEPU 2015.* p. 135-145

9. ePham, M. ; Ruetters, M. ; Heiland, S. ; Heckel, A. ; Radbruch. A; Bendszus, M. & Weiler, M. (2014). Peripheral neuropathy: detection with diffusion-tensor imaging. *Radiology.* (1):185-93. doi: 10.1148/radiol.14132837

10. Cuvillon,P ; Diaz, J. ; Blum, B. & Armissoglio, G. (2013). Regional anesthesia and ultrasound : How to reduce adverse outcomes?. *Le praticien en Anesthésie et réanmiation.* DOI : 10.1016/j praton.2013.10.005

11. Capdevila, X.; Choquet,O. & Abbal,B. (2012). *Gestion des compliactions neurologiques post-ALR périphérique.* En ligne : "http://sofia.medicalistes.org/spip/IMG/pdf/Gestion_des_complications_neurologiques_post_ALR_peripheriques.pdf"