

Case Report

Lipoma of the Proximal Forearm with Compression of the Superficial Radial Nerve

Roxana Maria Enescu¹, Alexandru Ioan Tomek², Marius Popescu¹, Ioan Lascar¹

¹Department of Plastic, Aesthetic Surgery and Reconstructive Microsurgery, Clinical Emergency Hospital Bucharest, Romania

²The Orthopaedics and Traumatology Clinic, Emergency University Hospital of Bucharest, Romania

REZUMAT

Compresia ramului senzitiv radial cauzată de un lipom în treimea proximală a antebrațului

Compresia nervului radial superficial ca urmare a prezenței unei mase tumorale în tunelul radial este relativ rară. Nervul radial se bifurcă în nervul radial profund (nervul interosos posterior) și nervul radial superficial (NRS), la aprox. 6-10 cm distal de septul intermuscular lateral și la 3-4 cm la nivelul marginii proximale a mușchiului supinator. NRS este un nerv senzorial, care trece anterior de marginea posterioară a mușchiului brahoradial și, în treimea distală a antebrațului, devine subcutanat, transmițând senzațiile la nivel dorso-palmar. NRS se poate comprima în orice punct al traiectului său, un risc mai ridicat existând în partea posterioară a mușchiului brahiradial, pe măsură ce nervul trece din structura profundă la cea subcutanată. Prezentăm cazul unei mase tumorale neobișnuite în zona cotului, prezentând simptome de durere și disestezie la nivelul feței dorsale a mâinii stângi, care iradia până la degetul mare și cel arătător. Pacientul în vârstă de 57 de ani, dreptaci, se prezintă cu simptomatologie debutată cu două luni înainte de intervenția chirurgicală, cu tumefacție discret dureroasă la palpare la nivelul bordului radial al treimii proximale a antebrațului stâng. Acuză dificultate în folosirea deplină a încheieturii, dar și imposibilitatea de a-și folosi normal degetele și articulațiile metacarpofalangiene. Examinarea IRM a antebrațului și cotului stâng dezvăluie o formațiune tumorală, cel mai probabil un lipom intermuscular localizat în arcada lui Fröhse. Expunerea chirurgicală definește un lipom cu contururi nete, ușor lobulate, în locul unde nervul radial se bifurcă în componenta superficială, respectiv profundă, lipom care a fost îndepărtat în totalitate în urma intervenției chirurgicale, fiind efectuată decompresia nervului și nevroliză. Diagnosticul de lipom a fost confirmat în urma examenului histologic. Pacientul și-a recăpătat în totalitate funcția neurologică după trei luni, fără semne de recurență, putând să își reia activitatea. Rezultatul funcțional al leziunilor nervului radial depinde de indicele de severitate, de localizarea leziunii și de vârsta pacientului. Neuropatiile compresive ale nervului radial reprezintă o patologie complexă, cu mulți factori etiologici, numeroase sindroame clinice și un risc ridicat de dizabilitate funcțională dacă diagnosticul nu este pus din timp și nu este inițiat imediat tratamentul. Acest lucru are un impact important asupra vieții socioprofesionale. Diagnosticul timpuriu, managementul terapeutic și tehnicile de operare, îngrijirea postoperatorie, stabilirea unui prognostic pentru fiecare caz medical în parte și evaluarea pe termen lung reprezintă tot atâția factori care asigură recuperarea cu succes a pacientului, îmbunătățirea calității vieții, o rată scăzută de morbiditate și costuri mai mici pentru pacient și societate.

Cuvinte cheie: compresia nervului radial superficial, lipom intermuscular, nerv radial, neuropatie de încarcerare, imagistică prin rezonanță magnetică

Corresponding author:

Roxana Maria Enescu, MD

Department of Plastic, Aesthetic Surgery and Reconstructive Microsurgery

Clinical Emergency Hospital Bucharest, Romania

e-mail: roxanamarina.enescu@yahoo.com

ABSTRACT

Compression of the superficial radial nerve secondary to a mass in the radial tunnel is uncommon. The radial nerve bifurcates into deep (posterior interosseous nerve) and superficial radial nerve (SRN) approximately 6 to 10 cm distal to the lateral intermuscular septum and 3 to 4 cm proximal to the leading edge of the supinator. The SRN is a sensory nerve that travels anteriorly on the undersurface of the brachioradialis and, in the distal one-third of the forearm, travels subcutaneously to provide sensation to the dorsoradial hand. The SRN can be compressed at any point along its course, but it is believed to be at greatest risk at the posterior border of the brachioradialis as the nerve transitions from a deep to a subcutaneous structure. We present a case of an unusual elbow mass presenting with symptoms of pain and dysesthesias on the dorsal radial forearm radiating to the thumb and index finger. A 57 year old right hand dominant man presented with a 2 months history of a progressively enlarging and mildly tender mass over the left radial proximal forearm with symptoms of pain and dysesthesias radiating to the dorsal aspect of the hand. He was also complaining of difficulty in fully extending his wrist, with normal extension of the fingers and metacarpophalangeal joints. Magnetic resonance imaging of the elbow and left forearm revealed a mass, most probably an intermuscular lipoma located at the area of the arcade of Fröhse. Surgical exposure defined a multilobulated lipoma, at the division of the radial nerve into its superficial and deep components, which underwent complete surgical excision, nerve decompression and neurolysis. The diagnosis of a lipoma was confirmed histologically. The patient had complete return of neurological function over a 3 month period, with no evidence of recurrence and has returned to his former activities. The functional outcome of radial nerve lesions is dependent on the severity index, location of the injury, age of patient. Compression neuropathies of the radial nerve are a complex pathology, with multiple etiologic factors, numerous clinical syndromes and the possibility of important functional disability when it comes to tardive diagnosis and treatment, which has a great impact on the socio-professional status. The importance of early diagnosis, the therapeutic management and operative techniques, the postoperative care, establishing the prognosis for each medical case and long term evaluation, are all part of the successful reinsertion of these patients, improvement in quality of life and diminished morbidity and costs for the patient and society.

Key words: superficial radial nerve compression, intermuscular lipoma, radial nerve, entrapment neuropathy, magnetic resonance imaging

INTRODUCTION

Compressive neuropathies in the upper limb represent a common and admittedly more and more frequent pathology, given how certain peripheral nerves possess an inherent risk of becoming injured due to anatomical positioning. [14] Obesity rate increase and the ageing of population altogether suggest that compressive neuropathies in the upper limb will become even more frequent in the next decade. [14] The most common sign of nervous compression is the carpal tunnel syndrome, prevailing in approximately 3% of the general population, followed by the cubital tunnel syndrome, and finally the radial tunnel syndrome, which is quite rare. [9] Lately, the radial tunnel syndrome has been known to become more frequent and its surgical treatment has also become more common. [9] The radial tunnel is defined as the virtual space created by the structures surrounding the radial nerve, as well as the posterior interosseous nerve and the nerve's sensory branch, as it travels past the proximal third of the forearm, from the elbow's articulation up to the proximal border of the supinator muscle. [1,15,17] Once the radial nerve bifurcates into the deep branch (the posterior interosseous nerve) and the superficial branch, the sensory branch has a distal trajectory, deep within the brachioradial muscle. [1,15,17] Approximately 9 cm proximal to the radial styloid, the nerve turns hypodermic and divides into

digital dorsal nerves, innervating the posterior side of the pollex, index and medius. [1,15,17] Compressive neuropathies of the radial nerve in the radial tunnel may come across anywhere along the neural pathway and can lead to a series of clinical manifestations, according to the neural branch that is involved. [3] Tumoral formations can develop proximal or distal from the supinator muscle and the arcade of Fröhse. Most reported cases were located above the radial head, thus causing a nervous palsy including both the posterior interosseous nerve and the superficial branch. It is very rare that the compression should only cause the sensory branch.

The superficial branch of the radial nerves is susceptible to trauma and compression because of its anatomical location. [4] Most frequently, the compression is produced on the posterior border of the brachioradial muscle, as the nerve makes its transition from the deep fascia and enters the subcutaneous space. [3] From a clinical point of view, compression manifests through pain, paresthesia in dorsal side of the forearm's radial border, irradiating in the pollex and index and varying according to anatomical distribution, with Tinel's sign + along the neural pathway (the most common change in the clinical trial). [3] Electrodiagnostic testing is usually negative, but it is also a part of post-therapeutic follow-up, and can prove really helpful should it be positive. [3] When sensory modifications happen alongside motor affliction,

one must consider other diagnostics, such as proximal lesions (cervical spine, posterior fascia of the brachial plexus) or the presence of a tumoral mass in the radial tunnel, compressing the posterior interosseous nerve and the sensory branch equally. [8,11]

Lipoma represents a rather rare cause for compression, but it has been known to affect either the radial nerve, its sensory branch or the posterior interosseous nerve. Peripheral nerve compression secondary to adjacent lipomas is usually quite rare, most frequently located in the forearm and the radiocarpal articulation. [16] In the beginning, these lesions present no symptoms whatsoever but, as they continue to grow, they may cause symptoms due to progressive compression. [16] Deeply encapsulated lipomas appear mostly in patients in their 40s or 50s and mostly in women and, in such cases, complete excision by means of surgery is the rule. The diffuse infiltrative type of lipoma appears more frequently among the young, irrespective of gender. [4] Many times, correct diagnosis is delayed, as it can be mistaken for other pathologies bearing similar symptoms, especially since they are more common: lateral epicondylitis, olecranon bursitis, de Quervain tenosynovitis, lateral antebrachial cutaneous neuritis. [3,8,11]

As we go on, we shall introduce a rare case of nervous compression produced by the development of a lipoma in the proximal third of the forearm, which required surgical excision and neural decompression of the superficial radial branch.

CASE REPORT

We would like to introduce you to the case of a 57-year-old male patient: a chemist operator, right handed and with urban background, he presented to the clinic accusing the following: (initially intermittent) paresthesia in the dorsal aspect of the left hand, accompanied by pain radiating into the elbow, a decrease in the amplitude of the extension in the radiocarpal joint, all of which started approximately 2 months ahead of the surgical intervention and had nothing to do with any injury or other potential triggers. One month after the symptoms started showing, the patient noticed a swelling, which caused slight pain upon palpation and was located in the radial border of the proximal third in the left forearm; the tumefaction continued to grow and exacerbate symptomatology: the paresthesia turned permanent and the pain increased, becoming more and more upsetting at nighttime, interrupting sleep and affecting work ability.

Pathological personal history let us know that the patient had hypertension, lumbar discopathy, cervical spondylosis, benign prostatic hyperplasia and paresthesia along the 4th and 5th fingers of the left hand, which began many years ago and had not been systemized. Also, the patient was suffering from chronic tobacco use and ethylism.

The patient's first medical consult takes place 6 weeks

after symptoms started showing up: a plastic surgery check-up is performed, as well as an orthopaedic consult, a Doppler ultrasound test of the upper left limb, ultrasounds of the soft tissues in the left forearm and a radiogram of the hand, forearm and bilateral elbow. Radiographies reveal no osseous lesions, the Doppler shows complete compressibility of deep veins, no signs of thrombosis here or in the cephalic or basilic vein. Soft tissue sonogram reveals a tumoral hypoechoic inhomogenous formation, with increased vascularity in the border and about 40/25 mm wide, located somewhere in the elbow articulation. After the clinical and paraclinical examination, a tumoral formation is suspected in the proximal third of the left forearm, which has the patient prepared for an MRI exam as soon as possible. The patient has the recommended MRI investigation within one week. With help from the intravenous contrast medium, the imaging of the left forearm and elbow reveals a 5 cm, 3.5 cm transversely, 2.5 cm antero-posteriorly, intramuscular cranio-caudal tumoral formation, situated on the anterolateral side of the left forearm, between the supinator muscle, the short and long extensor of the carpal bone, the brachioradial and brachial muscles, right past the elbow's articulation. The formation presents itself like a lipoma (high T1 and T2 signals, which disappear on fat-suppressed image sequences), without contrast medium caption. The formation has a clear contour, with slightly lobulated margins, and tangential contact with the vascular radial and ulnar branches, as well as the radial nerve. Radial and ulnar collateral ligament look normal. Common flexor tendon and common extensor appear normal. Signal doesn't change in the lateral and medial epicondyles. No



Figure 1. MRI specimen (sagittal image of the elbow articulation, revealing the extension of the lesion)

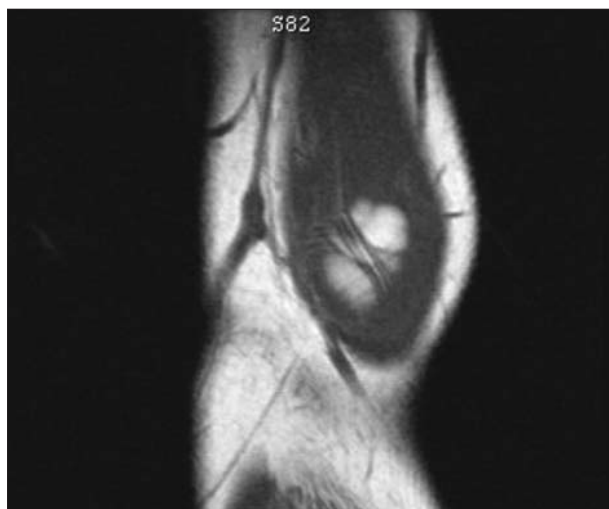


Figure 2. MRI specimen (tumor report, with nerves and vessels)

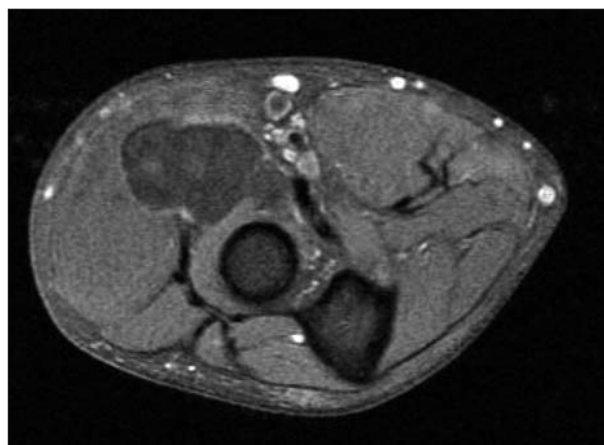


Figure 3. MRI specimen (axial image revealing an ovalish formation, in contact with the adjacent vascular nervous formations, in the arcade of Fröhse)

oedematous change in the olecranon or bicipitoradial bursa. No recent traces of fracture.

Due to rapid progression of symptoms and their negative influence upon everyday activities, it is decided that the patient be kept in hospital, in the plastic surgery clinic, for proper treatment.

Clinical examination revealed a round/oval tumoral formation in the radial border of the proximal third left forearm, measuring approximately 6/6 cm, mobile, slightly painful upon palpation, with normal looking superjacent cutis, having no visible signs of infection. The extension of the metacarpophalangeal and interphalangeal joints is within normal limits, with some slight decrease in the amplitude of the extension in the radiocarpal joint. Radial nerve sensitivity is abnormal, as the patient presents with paresthesia and hypoesthesia in the radial border of the left hand and forearm, with Tinel sign + the sensitive branch of the nerve.

Surgical intervention takes place under general anesthesia and application of hemostatic band, initiating the operation with an incision in the radial border of the proximal third in the left forearm, extended proximally to the radial border of the elbow.

The dissection brings to light a tumoral formation with the appearance of a lipoma, encapsulated in a fibrous tissue, slightly separated by the hypodermic tissue, multiloculated, bearing contact with radial nerve right after the latter's bifurcation, producing anterior displacement of the sensitive branch which stretches it, with partial embedment of a few motor branches in the tumoral mass, posterior and deep compartment, adhering to the radial periosteum, without invading the adjacent muscular tissue and leaving the articular capsule of the elbow intact.

The dissection is followed through by separating the neural branches of the radial nerve, external neurolysis, excision of the tumoral formation (the lump is then sent to



Figure 4. Tumefaction in the proximal third radial border of the left forearm



Figure 5. The incision

the anatomopathology department, in order to obtain a clear diagnosis; the extemporaneous examination confirms the lipoma, but a microscopic check of the excised lump, as well as the resected specimen, is also necessary), without

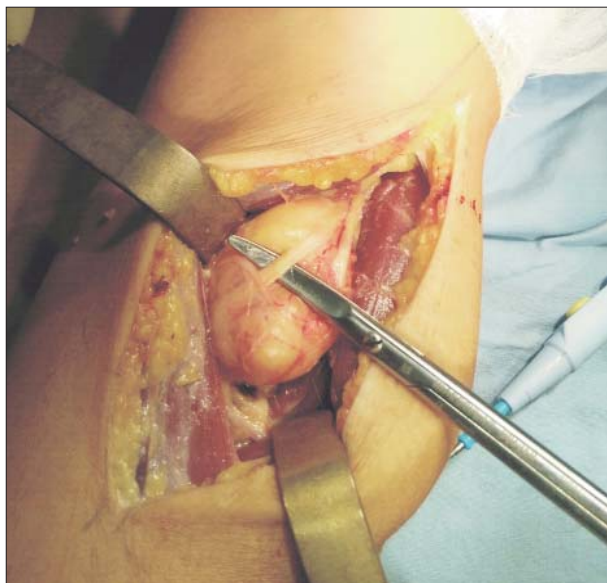


Figure 6. Dissection revealing the tumoral formation in contact with the radial nerve's branches

damaging the radial nerve branches, followed by lavage, hemostasis, placement of the drainage catheter, capitonage, application of Steri-Strip bandages, dressing, arm immobilisation with brachial plexus splint.

Histopathology test confirms the lipoma diagnosis (mature adipose tissue, separated by fine conjunctive septa), without no malignant signs.

The postoperative patient presents a normal degree of sensitivity, along with the disappearance of paresthesia, lack of muscular weakness at the posterior interosseous nerve-innervated site and complete extension of the radiocarpal joint.

Postoperative care consisted in 10 medical recovery sessions (kinotherapy, ultrashort waves, laser and elec-

trostimulation). Two months after the surgical intervention, the patient is able to return to the workfield and go back to his daily routine with no restrictions. Three months after the intervention, the patient returns to the clinic for check-up and presents total sensitive function, without any signs of neuroma or recurrence.

DISCUSSIONS

Compressive neural syndromes represent a common cause for pain, sensitive damage and muscular weakness. [4] The superficial branch of the radial nerve is susceptible to trauma and compression because of its hypodermic tract. [4] Usually, compression takes place along the fibrous strips in the hypodermic tissue between the brachioradial muscle's tendons and the long radiocarpal extensor. [4] In understanding the location and ethiology of neural compression, it is essential to have a good knowledge of the anatomy, with respect to the intermuscular septa, the fibrous tissues and the muscular borders. [6,9]

Tumoral formations producing neural compression are quite rare. The most common ones are synovial cysts, lipomas and fibroids. [16,19] Specialty literature comprises other described cases of intramuscular or parosteal lipomas in similar locations, affecting either the superficial branch of the radial nerve [7] or the posterior interosseous nerve. [12] In general, lipomas are relatively slow-growing tumors, initially asymptomatic and quite frequently diagnosed exactly during surgical exploration. [16,19] In most cases, they are excised completely without producing any neural damage. [16,19]

Our patient had a relatively short medical history (approximately 2 months) of tumoral formation in the proximal third of the forearm, with symptoms of sensitive neuropathy. MRI exam confirmed the presence of an intramuscular lipomatous tumoral formation, adjacent to the

Figure 7. a. Post enucleation aspect of the lipoma; b. Post enucleation aspect of the lipoma

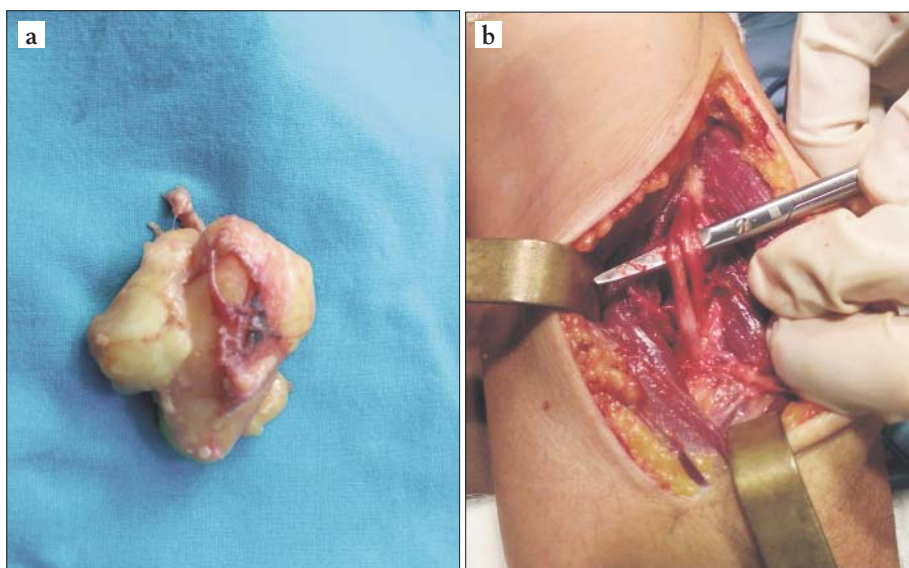


Figure 8. a. Immediate post-operative outlook; b. 1-day-old postoperative outlook



Figure 9. Microscopic imagery of the excised specimen: benign lipomatose tissue, with typical adipocytes, no evidence of malignant transformations

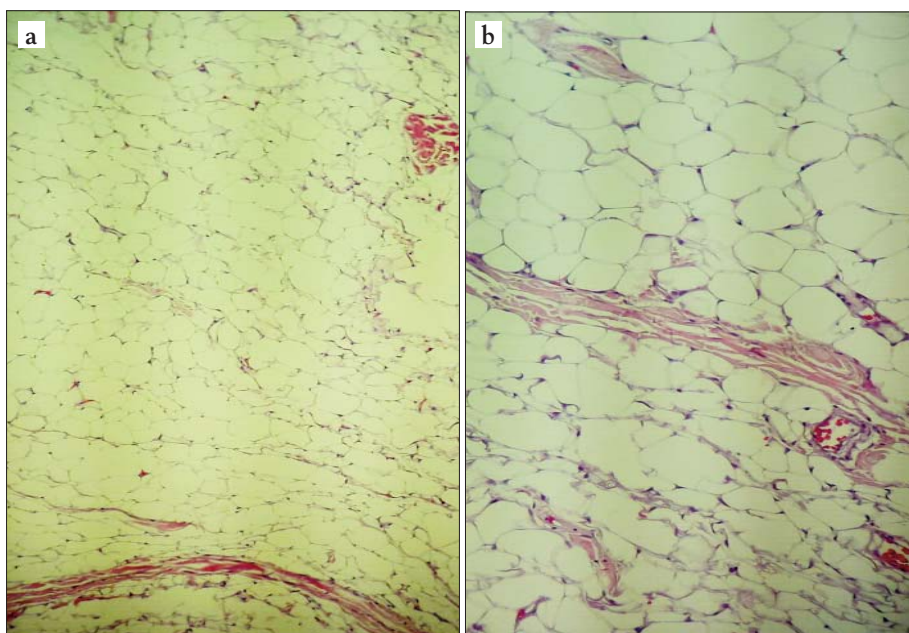
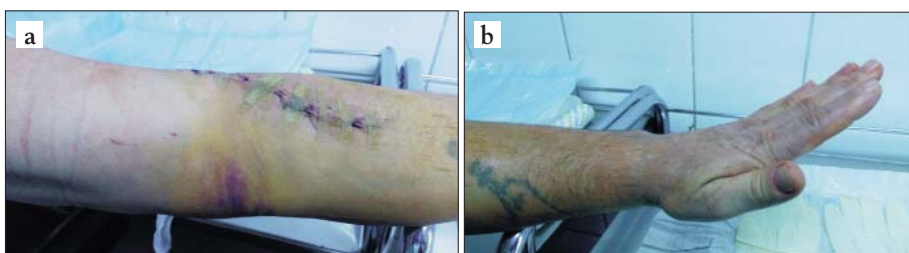


Figure 10. a. 5-day-old post-operative outlook; b. Finger extension



elbow joint, and offered details about the tumor's relation to the adjoining neurovascular formations, thus improving the preoperative planning and leading to a very accurate surgical excision. The surgical removal of the lipoma and the decompression of the radial nerve have led to the complete recovery of the sensitive function (S4). The latter has been interpreted via the system used by the Medical

Research Council, consisting in 6 stages of sensitive recovery:

- S0: absence of sensitivity;
- S1: recovery of the deep pain sensitivity
- S2: recovery of tactile sensitivity
- S3: recovery of superficial pain sensitivity and tactile sensitivity

- S3+: partial recovery of tactile two-point discrimination;
- S4: complete recovery.

For certain nerves, among which we also find the radial nerve, motor function is much more important than sensitivity recovery. [14] Nevertheless, we interpret results as negative when the recovery of cutaneous function happens, but severe pain persists, disregarding the degree of the motor recovery. [14] The most important aspects in the prognosis of the neural recovery are [18]: the patient's age, the level and the nature of the lesion, the operative instance, the cause of the lesion.

The superficial branch of the radial nerve has a bad reputation as far as recovery goes, particularly for distal lesions, which can produce severe neuropathic pain. [14]

CONCLUSIONS

Compressive neuropathies of the radial nerve include posterior interosseous nerve syndrome, radial tunnel syndrome and Wartenberg syndrome. When met with a patient who presents weakness in finger extensors or paresis, pain in the radial border of the forearm or paresthesia in the sensitive branch department, one must definitely consider one of the aforementioned diagnostics. Initial treatment is usually conservative and surgical treatment is indicated only when the non-surgical treatment has failed to obtain wanted results or in case of severe compression, usually generating satisfactory results.

Functional prognosis of radial nerve lesions depends on the lesion's degree of severity, the anatomical positioning of compression and the patient's age.

Compressive neuropathies in the upper limb describe a complex pathology, with several clinical syndromes and ethiological factors, with important functional influence, related to socio-professional aspects, bearing a significant morbidity rate and ultimately producing non-reversible damage should the diagnosis and treatment be inadequate. It is highly important to get the right diagnosis on time, to follow a multimodal therapeutic scheme, to benefit from the necessary postoperative care, to establish prognosis for each case individually and make a long-term evaluation, since all of these add up to proper social and professional readaptation of certain patients, improving the quality of their lives and decreasing morbidity rate, as well as costs for both the patient and society on the whole.

REFERENCES

1. R.A. Abrams, M.J. Botte, R.L. Lieber, R.J. Ziets, "Anatomy of the radial nerve motor branches in the forearm". *J Hand Surg* 1997;22A:232-237.
2. E. Akelman, M. Barnum, R.D. Mastey, A.P.C. Weiss, "Radial tunnel syndrome". *Hand Clin* 1996;12:679-689.
3. Alan, C., Craig, M., Dang, MD., Rodner, MD., "Unusual compression neuropathies of the forearm, Part I: Radial nerve". *J Hand Surg* 2009;34A:1906-1914.
4. R.C. Bachusz, A. Balakrishnan, C. Balakrishnan, D. Careaga, D. Elliot, "Intraneural lipoma of the radial nerve presenting as Wartenberg syndrome: A case report and review of literature". *Can J Plast Surg* 2009;17(4):e39-e41.
5. R. Birch, G. Bonney, C.B. Wynn Parry, "Rehabilitation". *Surgical Disorders of the Peripheral Nerves*, London, Churchill Livingstone, 1998:451-466.
6. M.B. Cermak, J.D. Lubahn, "Uncommon nerve compression syndromes of the upper extremity". *J Am Acad Orthop Surg* 1998; 6:378-86.
7. I.C. Chen, T. Chung-Yuh, L. Tu-Sheng, "Superficial radial nerve compression caused by a parosteal lipoma of proximal radius: a case report". *Hand Surg* 2005, 10(2-3):293-296.
8. A.L. Dellon, S.E. Mackinnon, "Radial sensory nerve entrapment in the forearm". *J Hand Surg* 1986; 11A:199-205.
9. H. Ellis, A.J. Robson, M.S. See, "Applied anatomy of the superficial branch of the radial nerve". *Clin Anat* 2008;21:38-45.
10. Y. Fortems, T. Lawrence, P. Mobbs, J.K. Stanley, "Radial tunnel syndrome. A retrospective review of 30 decompressions of the radial nerve". *J Hand Surg Br* 1995, 20(4):454-459.
11. G. Foucher, M. Lanzetta, "Entrapment of the superficial branch of the radial nerve (Wartenberg's syndrome): a report of 52 cases". *Int Orthop* 1993;17:342-345.
12. K. Ganapathy, V. Seshadri, T. Winston, "Posterior interosseous nerve palsy due to intermuscular lipoma". *Surg Neurol* 2006, 65(5):495-496.
13. M.C. Gulliford, R.A. Hughes, R. Latinovic, "Incidence of common compressive neuropathies in primary care". *J Neurol Neurosurg Psychiatry* 2006;77:263-265.
14. R.N. Hotchiss, S.H. Kozin, W.C. Pederson, S.W. Wolfe, "Green's Operative Hand Surgery" sixth edition Elsevier Churchill Livingstone; 977-1012.
15. A. Ispas, V. Panaitescu, V. Ranga, C. Zaharia, "Anatomia omului". Editura Cerma, Bucuresti.
16. J.I. Kendrick, G.S. Phelan, J.M. Rodriguez, "Lipoma of the upper extremity causing nerve compression". *Am J Surg* 1971; 21:298-306.
17. J.D. Lubahn, B.R. Parry, S.J. Thomas, D.E. Yakin, "The anatomical relationship between the posterior interosseous nerve and the supinator muscle". *J Hand Surg* 2000;25A:936-941.
18. H.J. Seddon, (ed) "Peripheral Nerve Injuries", Medical Research Council Special Report Series No. 282, London, Her Majesty's Stationery Office, 1954.
19. J.B. Steichen, J.W. Strickland, "Nerve tumors of the hand and forearm". *J Hand Surg* 1977; 2: 285-91.