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WHAT TO EXPECT AND HOW TO DISCUSS ABOUT OUTCOMES AFTER NERVE SURGERY REPAIR?

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SUMMARY

Introduction

Hand injury is one of the most common problem required the doctors help and represent 10% cases at emergency room (Ghosh *et al.* 2013). One of the main problem in the hand injury are peripheral nerves injuries and difficult to predict the final outcomes. The type of treatment depends of the type of nerve injury and the outcome of nerve reinnervation depends from many factors.

Aim

The aim of study is to presents what are the patient's expectation and doctor's prediction with final results. Is the correlation with real possibility of reinnervation and recovery of the injured nerves depends on degree and level of the peripheral nerve injury? What is the best way to inform the patient most accurately?

Material and methods

The study has been performed on the own results from surgical experience and reviewing literature. We reviewed and collected data from 153 patients who were operated in Department of Traumatology, Orthopedics and Hand Surgery. Nerve repair with end to end suture was performed

CZEGO NALEŻY SPODZIEWAĆ SIĘ I JAK INTERPRETOWAĆ WYNIKI PO OPERACJACH PRZESZCZEPU NERWU?

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STRESZCZENIE

Wstęp

Urazy ręki są jednym z częstszych problemów wymagających pomocy lekarskiej i stanowią 10% przypadków zgłaszających się na szpitalne oddziały ratunkowe (Ghosh *i wsp.* 2013). Jednym z głównych problemów urazów ręki są uszkodzenia nerwów obwodowych I trudności związane z przewidywalnością ostatecznych wyników leczenia. Rodzaj proponowanego leczenia zależy od typu uszkodzenia nerwów a wyniki reinerwacji zależą od wielu czynników.

Cel

Celem badania jest zaprezentowanie, jakie są oczekiwania pacjenta i przewidywania przez lekarza końcowych wyników leczenia. Czy istnieje korelacja między realnymi możliwościami reinerwacji i powrotu funkcji uszkodzonych nerwów w zależności od stopnia i poziomu uszkodzenia nerwu obwodowego? Jaki jest najlepszy sposób właściwego informowania pacjenta?

Materiał i metody

Badanie zostało przeprowadzone na podstawie doświadczeń chirurgicznych i przeglądu piśmiennictwa. Zostały zebrane dane i poddane analizie na podstawie 153 pacjentów operowanych w Klinice Traumatologii Ortopedii I Chirurgii Ręki. Wykonano szycie nerwów koniec do końca oraz rekonstrukcje

and in late cases nerve reconstruction was performed with use of free sural nerve grafts.

Results
Return of muscular function in groups with nerve lacerations: ANOVA test at p = 0.0057; ulnar nerve mean = 2.09, SD ± 1.64; median nerve mean = 4.29, SD ± 0.76; median and ulnar nerves mean = 1.83, SD ± 1,48.

Return of sensibility in groups with nerve lacerations: KRUSKAL-WALLIS TEST at p = 0.8238; ulnar nerve mean = 2.14, SD ± 1.55; median nerve mean = 2.07, SD ± 1.69; median and ulnar nerves mean = 1.83, SD ± 1,17.

Conclusions
For better understanding and making the right therapeutic decision, patient should receive all the information in simple and understandable way. Final outcomes after treatment depend on the level of injury and nerve that was injured. A good communications and relationship used between a doctor and patient can lead to increase doctor's job satisfaction improvement and patient's self-confidence, motivation to rehabilitation process and final outcomes.

Keywords: nerve injury, nerve reinnervation, posttraumatic stress, final outcomes

z wykorzystaniem przeszczepów z nerwu łydkowego.

Wyniki
Powrót funkcji mięśniowych oceniony testem ANOVA, p = 0,0057; nerw łokciowy średnia = 2,09, SD ± 1,64; nerw pośrodkowy średnia = 4,29, SD ± 0,76, nerw pośrodkowy i łokciowy średnia = 1,83, SD ± 1,48.

Powrót czucia w poszczególnych grupach z uszkodzeniami nerwów: test KRUSKAL-WALLIS , p = 0.8238; nerw łokciowy średnia = 2,14, SD ± 1,55; nerw pośrodkowy średnia = 2,07, SD ± 1,69; nerwy pośrodkowy i łokciowy średnia = 1,83, SD ± 1,17.

Wnioski
Dla lepszego zrozumienia i podejmowania właściwych decyzji terapeutycznych, pacjent powinien otrzymać wszystkie informacje w prosty i zrozumiały sposób. Ostateczne rezultaty po zabiegu zależą od stopnia uszkodzenia nerwu i który nerw został uszkodzony. Dobra komunikacja i relacje między lekarzem a pacjentem, mogą prowadzić do zwiększenia poprawy satysfakcji z pracy lekarza, motywację do procesu rehabilitacji i poprawą końcowych wyników.

Słowa kluczowe: uszkodzenie nerwu, reinerwacja nerwu, stres pourazowy, wynik końcowy

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Introduction

Hand injury is one of the most common problem which requires the doctors help and represent 10% cases at emergency room (Bontioti *et al.* 2003). One of the main problems in the hand injury are peripheral nerves injuries and difficulties to predict final outcomes. The consequences of peripheral nerves injury are muscle dysfunction, sensory disorder, posttraumatic pain, painful neuroma, causalgia, neuropathic pain. Patient during the first contact with physician is under stress caused of injury and secondly cause of overwhelming quantity of unknown facts about future of the damaged hand and further possibilities for existence in the new life situation. Patient's life is going to change and patient must face with the new socio-economic reality. Patient must know the extent of sustained damages, possibilities of the treatment and prediction

of the final results. Analyses together with patient on the mechanism of the injury and clinical situation are strong aspect for better realizing difficult anatomy of the injured hand and limited biological potential for regeneration of damaged tissues. The type of treatment depends from the type of nerve injury and the outcome of nerve reinnervation depends from many factors. The hand and face are the most visible and social important parts of the human body. The hand is a sensory organ with advanced sensory receptors and links us to the outer world. The hand injury causes serious implication in the mental condition of the patient. Neurological hand presentation has a huge part of the motor cortex and injured hand has an impact at the mental condition of deterioration. We can expect in the patient a depression, psychosomatic symptoms, decrease of motivation, emotional instability, decrease of concentration, sleeping disorder, loss of appetite.

Aim

Aim of the study is to presents what are the patient expectation and doctor prediction with final result in correlation with real possibility of reinnervation and recovery of the injured nerves depending on degree and level of the peripheral nerve injury.

Material and methods

The study has been performed on the own results from surgical experience. We reviewed and collected data from 153 patients who were operated in Department of Traumatology, Orthopedics and Hand Surgery. Nerve repair with end to end suture was performed and in late cases nerve reconstruction was performed with use of free sural nerve grafts.

Results

For better understanding and making the right therapeutic decision, patient should receive all the information in simple and understandable way. Patient should know what kind of injury suffered and what are the consequences of this damage and possibility of the surgery treatment. Nerve injury is defined by the mechanism of damage, the degree and by the affected parts of the nerve. Mechanism of injury may be stretching, compression, sharp or irregular laceration. Degree of the nerve injury is evaluated by Seddond's and Sunderland's classification as neuropraxia, axonotmesis and neurotmesis. According to this classification's the reconstructive surgery intervention is determined. In neuropraxia myelin of the nerve is damaged and temporary block of conduction is present. In this case, fast rate of the recovery is present and surgery is not needed. Healing time is varying from a few days to 4 months. Tinel's sign is not present. In axonotmesis, more components of the nerve are degenerated with axon included and epineurium is intact. Mismatch of the fascicles does not occur. Rate of recovery is slow and surgery repair is sometimes needed. Tinel's sign is present and help to assessment follow the gradual recovery. The most serious injury is neurotmesis, all parts of the nerve components are injured, for chance to recover surgery of the nerve is indicated. Tinel's sign is present over the site of the injured nerve. Progress of the nerve regeneration strictly corresponds with slow transport of the proteins in the neurofilaments.

Regeneration starts at the time of nerve repair and proceeds at a rate 1mm per day from repair site of the nerve. However, after 18–24 months after injury the neuromuscular junctions is undergoing to irreversible damage and muscle undergoes atrophy and fibrosis. After this time, function of the repaired nerve will not return. Sensory receptors are not going the degeneration and sensory recovery occurs even after longer time after injury (Hébert-Blouin and Spinner 2017). Final outcomes after treatment depend on which nerve was injured and at the level as well. The best results after surgery treatment are for median and radial

nerve and the worse are for the ulnar nerve. Explanation is that ulnar nerve is responsible for intrinsic muscle innervation which is responsible for delicate move (Ruijs *et al.* 2005). In case of ulnar nerve injury, the recovery of motor function is 71% less than median nerve. Sensor function is equal for all nerves (Bontioti *et al.* 2003). According to Noworolnik *et al.* (2008), patients with shorter time to surgery had better results in DASH scale, patients with medial nerve injury had the best return of motor function in all of the examined groups. There was no statistically significant difference between groups in return of sensibility or DASH score in our study (Figures 1 and 2). Nerve injury in the proximal part of the nerve has worse reinnervation outcomes than injury in the distal part of the nerve. Better results we should expect when surgery procedure is performed as quickly as is possible, nerve gap is not wide and primary suture end to end is possible to perform without using grafts (Murovic 2009). The more traumatized nerve injury and contaminated environment around the injured nerve than final outcomes are worse.

Patient age is important for nerve regeneration. The younger patient is the prognosis for regeneration is better (Ruijs *et al.* 2005). Patients under 16 years old have four times bigger chance for satisfactory

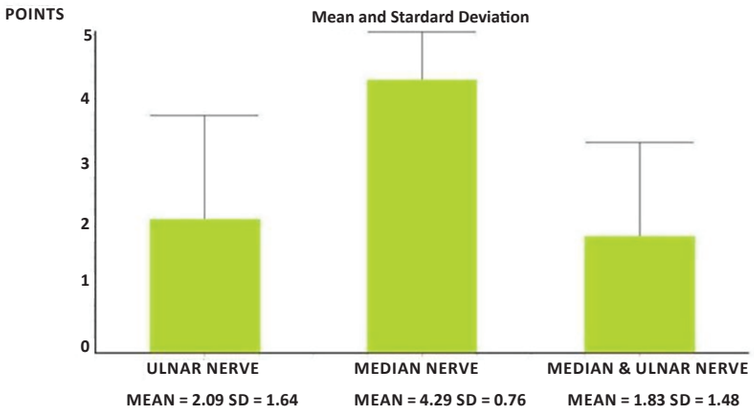

Figure 1. Return of muscular function in groups with nerve lacerations according to Noworolnik *et al.* (2008) ANOVA TEST at p = 0.0057.

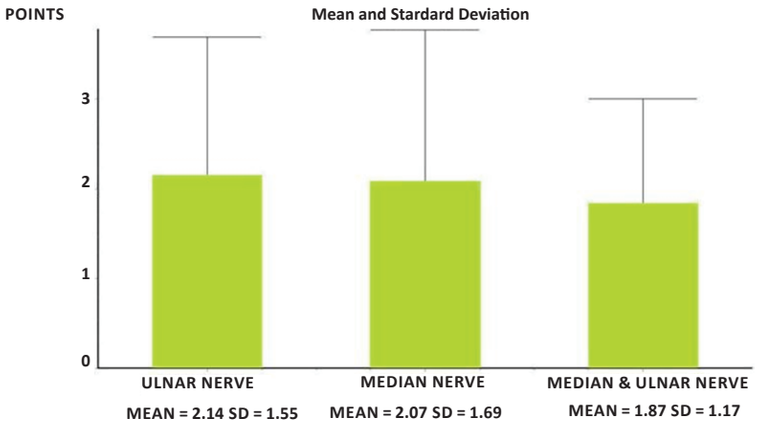

Figure 2 Return of sensation and groups with nerve lacerations according to Noworolnik *et al.* (2008) KRUSKAL--WALLIS TEST at p = 0.8238.

outcomes of the treatment motor and sensory deterioration. Despite of peripheral nerve injury there is also brain cortex disorganization, nerve fascicles do not always match accordingly the primary configuration. This has a significant impact on sensory cortex. Cause of brain plasticity sensory map of the hand after time is recovered again.

Time of surgery is mandatory factor in the process of regenerations. Timing repair of the nerve is follow "3 plus 1" rule. Depend of the type injury repair should be done or could be delayed. Early repair is performed within 3 days after sharp injury of the nerve, hematoma, aneurysm or fractured bone compression. Subacute repair occurs within 3 weeks after blunt nerve injury for example: chainsaw laceration. Delayed repair occur after 3 months and up to 6 months after non penetrating nerve injury for example gunshot wounds, stretch injuries. Late surgery is performed after 1 year as a salvage procedure (Horowitz *et al.* 1979).

Psychological implication on hand problems has important effect on the patient's quality of life. The posttraumatic stress experience has the compared impact on Event Scale Score as have a survivor from the sinking ship (Horowitz *et al.* 1979). There can be distinguished three stages after injury: shock, growing awareness and acceptance. Patient should be carried through all this stages. We should make good explanations using simple words about injury, treatment options, surgery, medical care and rehabilitation. All of this mention above gives opportunity for better cooperation, understanding and better final outcomes. Appropriate information given to a patient will promote better understanding and involving in decision making process without disappointment and pressure. We have to remember that usually patient forget about 40–80% information provided by physician. Another fact is that 60% of our patients cannot explain the meaning of the medical words and only 15% can admitted that they do not understand (Kessels 2003). Here we can mention words of George Bernard Shaw: "The single biggest problem in communication is the illusion that it has taken place".

Dissatisfaction and complaining of the patient are due to breakdown in relationship between doctors and patient. Medical model of communication has more recently evolved from paternalism to individualism. Sometimes doctors overestimate their ability in good communication with patients. According to study 75% orthopedic surgeon believed that they communicated satisfactory with their patient's but only 21% of patient's reported satisfactory communication with their orthopedic surgeon. Good communication and interpersonal skills help doctors to gather information from patient's and give right diagnosis, treatment and care. Accurate diagnoses, medical advice, therapeutic instructions, good relationships with patients are the corner stone in medical practice. Patient should be involved in decision making position and should feel that all decisions are taken together with doctor.

Good communication helps to regulate patient's emotions, facilitate comprehension information and allow to recognized patient needs.

For patients the most important sources of psychological support are their doctors. Empathy from doctors are the most powerful support to reduce anxiety, feelings of isolations and loneliness in the medical fields (Houts *et al.* 1998). Patients reporting good communication have better satisfaction and are more willing to share appropriate information for accurate diagnosis, follow doctor's advice.

As we known many times we have to prepare patient for receive a bad news and worse scenario of the treatment. Bad news affects a patient's future adversely and seriously. Telling the patient's truth is very important factor in medical care. As doctor we have ethical and legal obligations

to provide information as patient desire about surgery procedure, complications and rehabilitation process as the important part of the final results. We have to disclose the truth and assist the patient's in decision-making and then we can expect better patient's satisfaction and cooperation. Very often the most important thing is to how to be honest with the patient and not to destroy hope but again will be better outcomes when the patient hears accurate information.

The form of giving information is important as well. Mostly patient get information as the spoken way, but this is not successful method (Ha and Longnecker 2010). Written information is better remembered as only spoken. Patient with low education does not understand written information and pictures, drawing, cartoon illustrations are very effective strategy for better understanding (Delp and Jones 1996). Patient can recall only 14% information's after spoken medical instructions and 85% information's after pictograph enhancement medical instructions (Houts *et al.* 1998). Technological aids can also help in better understanding. Using video presentations, computer, tablets, smartphones as a tool for showing X-rays, computer tomography and surgery pictograms can help to understand patient anatomy, illness and surgery.

Knowing all these facts above we have to use our interpersonal skills, knowledge and experience for introduce our patient's difficulties, limitations end average expectations after nerve surgery.

Nerve repair after injury are challenges and difficulties in reconstructive surgery procedure. Still there are no golden surgery techniques which ensure full recovery of tactile discrimination in the hand although protective sensibility is fully recovered. Restore motor and sensory function of the hand after nerve repair is very complex process and there is need of functional changes from fingertips to the brain. No matters how accurate will be the reconstructive surgery technique, axonal misdirection will happen and brain cortex will need a time to relearn new sensory map of the hand.

Multiple and advanced hand function make a difficult assessment after nerve repair. It is worth to show the patient scale of assessment sensory and motor functions-MRC scales (Medical Research Council & Committee). Disadvantage of sensory scale is very subjective its character and thus the more patient understand the more appropriate date of the sensory exam will be received. Because the patient should be involved actively in the recovery process, we present specific sensibility test such as detection test, discrimination test, identification test with according explanations. Most common used test for single stimulus is Semmes-Weinstein monofilaments. Commonly used test for exam discriminative capacity is two-point discrimination test (2PD) to assess functional hand sensibility. Identification test is another standardized test based on identification of the shapes and textures. Instrumental assessment is mandatory and we use electromyography, ultrasound and magnetic resonance for appropriate assessment of the injured nerve.

Discussion

Motor and sensory impaired functions after nerve injury need to appropriate treatment. Final outcomes depend from many factors such as: age, mechanism of injury, type of injury, level of injury, time of surgery- the early the better-and the time frame for surgery is till 6 months, type of surgery, specific nerve involved – radial nerve recover better than median nerve and letter recover better than ulnar nerve. The best results are when nerve recovery occurs spontaneous and surgery is not indicated. Orthopedic surgeons perform surgery for improve conductivity of the injured nerve and for giving the patient better final effects of the surgery treatment. Although our aim is to perform accurate reconstructions of the injured nerve the important factor

involved in functional final outcomes is cortical remodeling. Children present excellent recovery in contrast to adult patients. This "age-window" plays the same role in other learning process like acquisition ability to communicate with second language during childhood. A good communications and relationship between a doctor and patient used to increase doctors job satisfaction improve patient's self-confidence, motivation in rehabilitation process and final outcomes.

Conclusions

Nerve surgery need meticulous surgical skills and dexterity but final results depend from many factors mentioned in this study. Talking with patient about kind of injured nerve, appropriate explanation anatomy and physiology of nerve regenerations using simple words adjust to patient culture origin and level of education guarantee better cooperation and results.

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