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Radial Nerve Paralysis Caused by Drug Injection

—Report of Two cases—

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Introduction

So-called iatrogenic nerve injury occupies 20.0 per cent—172 cases out of 861 cases of the traumatic peripheral nerve paralysis which were treated at the authors' clinic during 15 years and 9 months from April 1963 to December 1978. Nerve injuries due to the drug injection were 57 cases (33.1 per cent of all iatrogenic nerve injury). They happened mainly in the radial nerve (30 cases) and the sciatic nerve (7 cases). Analysis of the radial nerve injury revealed high percentage (32 per cent) of the iatrogenic nerve paralysis, while 18 per cent were due to the industrial nerve injury and 15 per cent due to the traffic accidents.

In this paper, the authors reported two interesting cases of the radial nerve injury caused by the intramuscular injection of mixture of the steroid and local anesthetics.

Case report

Case 1 : A 19 year-old female had a local intramuscular injection at the tender spot of the left elbow for the treatment of shoulder arm syndrome on May 13, 1970. The injected drug was a mixture of 1 per cent procaine 1 ml and dexamethasone 1 ml. Because of sharp radiating pain, injection was quitted at half and reinjection was done soon on another point close to the first point but with same radiating pain. Immediately after the injection, drop hand was observed. (Fig. 1) The patient was admitted for the treatment. On physical examination, manual muscle test revealed wrist extensor 3-, finger extensor 0, thumb extensor 0. Electromyographic examination revealed no voluntary contraction in extensor digiti communis, extensor and abductor pollicis, only with fibrillation potentials. Blood chemistry and urinalysis showed no abnormality. As physical therapy for two and a half months produced

Key words : Iatrogenic nerve injury, Injection nerve paralysis, Intramuscular injection, Toxic effect of drug, Needle injury.

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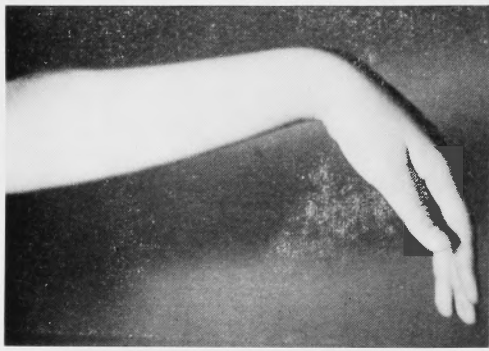


Fig. 1. Case 1. A drop hand was observed on the admission to the hospital, with complete denervation potentials in the thumb and finger extensors by E.M.G. examination.

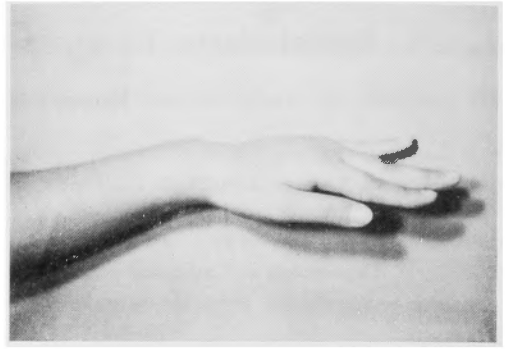


Fig. 3. Case 1. Extension of the fingers became possible at the third month of the surgery.

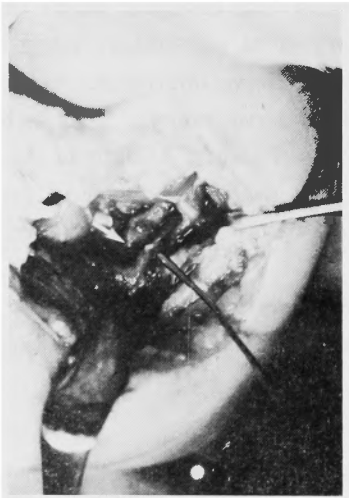


Fig. 2. Case 1. Operative findings. The deep branch of the radial nerve appeared markedly edematous. There were two severe constrictions corresponding to the injection sites. (Arrow indicates the constricted radial nerve.)

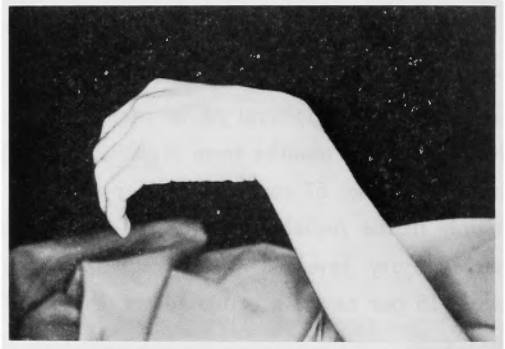


Fig. 4. Case 2. A drop hand with muscle atrophy was observed on admission to the hospital. (Four months after the injection)

severely edematous except two constrictions, surrounded by massive fibrous tissue. (Fig. 2) End-to-end suture of the nerve was done after the removal of 2.3 cm of the injured nerve including two constriction sites.

Postoperative course : Three months after the surgery, finger extension became possible. (Fig. 3) M4 recovery of the radial nerve was obtained at 6 months after the surgery. No abnormality was observed at 8 years' postoperative follow-up.

Case 2 : A 26 year-old-male, taxi-driver, had a local injection at the middle of left

no improvement, operative treatment was done on August 18, 1970.

Operative findings: There were two constrictions in the radial profundus nerve just distal to the bifurcation to the superficial radial nerve at radial capitulum, corresponding to the injection sites. The deep branch of the radial nerve appeared to be

arm at an elsewhere hospital on September 6, 1977, because of brachialgia (dull pain in left arm) for 2 weeks. Injection was done at the middle arm at a tender spot with a mixture of 1 per cent Lidocaine 7 ml and dexamethasone 1 ml. At the middle of the injection, the patient complained of severe pain in the arm and a complete radial nerve paralysis was observed immediately after the injection of the total amount of the drug. Physical therapy for 3 months produced no improvement of the paralysis. The patient was transferred to the authors' clinic, on January, 1978. Physical examination on admission revealed a drop hand with muscle atrophy at forearm and with sensory loss over the radial nerve region. (Fig. 4) Manual muscle test showed wrist extensor 0, finger extensor 0, thumb extensor 0. Electromyographic examination revealed denervation potentials with no voluntary contraction in the muscles innervated by radial nerve. Roentgenological examination of the cervical vertebrae and the humerus was within normal limits. Surgical intervention was done on February 2, 1978 (about 5 months after the injection.)

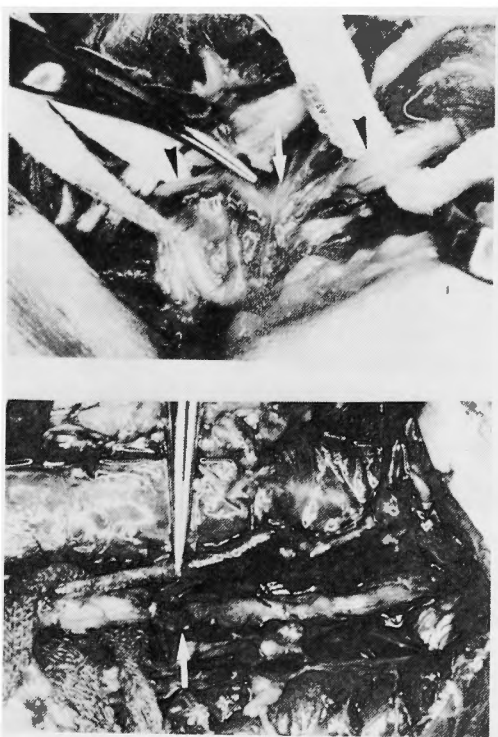


Fig. 5. Case 2. Operative findings. Upper portion: There was marked scar formation around the radial nerve with a severe constriction. (Arrows indicate the radial nerve.) Lower portion: Neurorrhaphy was done, removing 1.5 cm segment of the constricted portion, after the neurolysis. (Arrow indicates the sutured site of the nerve)

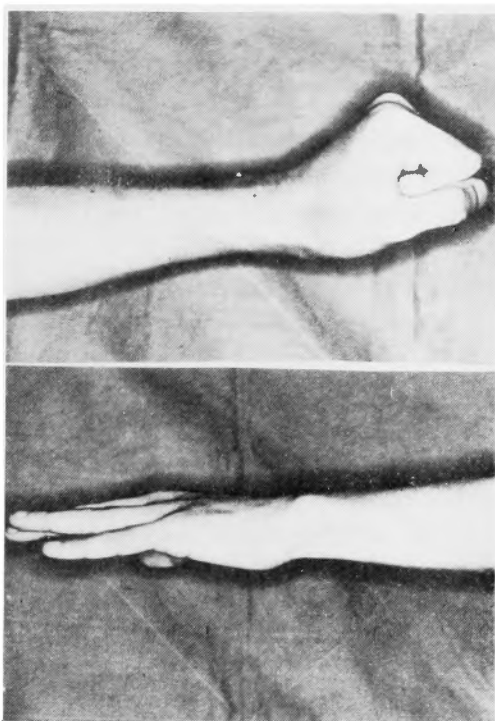


Fig. 6. Case 2. Follow up at the eighth month after the surgery. Wrist and finger extensions became possible.

Operative findings: It was extremely difficult to expose the radial nerve, because of severe adhesion and scar formation. The radial nerve was thin, with one third of normal thickness and with dark brown discoloration, for ca. 10 cm in length. There was a severe constriction corresponding to the injection site (Fig. 5). At the constriction, the nerve had only a membranous connection. There was no response to the electric stimulation. Careful neurolysis was done under the operating microscope. A return of the blood supply to the nerve was observed by the neurolysis, except for the constricted area. End-to-end suture was done after the removal of fibrotic nerve, ca. 1.5 cm in length including the constricted area (Fig. 5).

Postoperative course: Tinel's sign progressed 15 cm from the sutured site in 6 months after the surgery. Dorsiflexion of the wrist became possible at 7th month. At 8th month, extension of fingers became possible (Fig. 6). Complete return of the function was observed at 18th month after the surgery.

Histological findings of the removed nerve: Marked thickening of epineurium with decreased number of axon and myelin sheath with marked fibrosis was noted at the nerve trunk proximal to constriction. (Fig. 7) Foci of vascular proliferation and lymphocyte infiltration were also observed. Marked degenerative findings with scanty cell element was observed in the distal nerve trunk to the constriction.

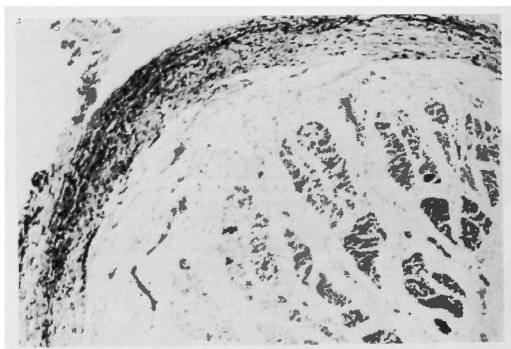


Fig. 7. Case 2. Marked thickening of the epineurium with decreased number of the axons was observed in the edematous nerve trunk, just proximal to the constriction. (Bodian stain, $\times 180$)

Discussion

There are many factors considered to be mechanism of the injection nerve paralysis, such as toxic effect of the injected drug, injury to nerve fibers by needle, hematoma formation due to vascular damage, circulatory disturbance by injecting a large amount of drug into the nerve trunk, and consequent adhesion and constriction of the nerve trunk^{1-3,6-8}). There have been numerous reports on the nerve paralysis due to injection of antibiotics and pyrine derivatives^{4),5)}. However, there are few reports on nerve paralysis caused by local injection of steroid and local anesthetics such as these cases reported on this paper. The authors are afraid that these kinds of the injection paralysis will increase gradually because of frequent application of the local injection of steroid for the treatment of shoulder arm syndrome, epicondylitis, and so on. The mechanism of the nerve paralysis by the steroid injection is not clear. However, mechanical injury by needle to the nerve cannot be ruled out, because there were sharp constrictions of nerve trunks correspondent to the injection sites. In addition to it, hypersensitivity to the drug also cannot be ruled out, although

family history did not prove positive. It is apparent that the radial nerve is vulnerable to the injection injury, because the nerve is extremely immobilized in its course by the humeral bone and the supinator tunnel.

The authors continue conservative treatment for 3 months, except for the case of injection of extremely toxic materials. If there is no improvement of the paralysis after the injury, the authors undertake internal and external neurolysis to remove scar tissue in and around the nerve and to decompress tension in nerve tissue. Neurorrhaphy was done in two cases reported in this paper, because of the severe constriction with scarce continuity of the injured nerve. Results of the treatment of the injection nerve paralysis at the authors' clinic were as follows: excellent in 3 cases, good 26, fair 5, poor 3, lost 1 by the conservative treatment, and excellent in 3 cases, good 4, fair 2, poor 1 by the surgical treatment. Excellent and good occupied 78 per cent in the conservative treatment and 70 percent in the surgical treatment. The frequent occurrence of this type of the nerve injury suggested a caution to those who are engaged in the medical and surgical practice. It is important to prevent the injection nerve paralysis, keeping in mind the regional anatomy of nerve trunk on administering drug intramuscularly. If the paralysis happens, the patient should be treated in all sincerity until satisfactory healing occur.

Summary

Injection nerve paralysis occupies 33 per cent of the iatrogenic nerve paralysis at the authors' clinic. More than a half of injection nerve paralysis occurs in the radial nerve.

The authors reported interesting two cases of radial nerve paralysis caused by the local injection of a mixture of steroid and local anesthetics.

The authors called attention to those who are engaged in the clinic because of frequent use of the local intramuscular injection of these drugs.

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和文抄録

注射に起因する橈骨神経麻痺の2例

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われわれの教室において過去15年9ヶ月間に取り扱った末梢神経損傷861例のうち, 医原性麻痺は172例(20%)であった。そのうち, 注射による神経麻痺は33%を占めた。注射により損傷された神経は橈骨神経が30例(52.6%)と大半を占めている。

症例1 19才, 女子, 学生。

1970年5月13日, 左肘関節外側の圧痛点到1% Procaine 1ml と Dexamethasone 1ml の局注を受けた。直後に下垂手を来した。同年8月18日, 手術。手術所見; 左橈骨小頭附近で橈骨神経に2ヶ所の絞扼を認めた。端々吻合を行ない良好な回復を得た。

症例2 26才, 男子, タクシー運転手。

1977年9月6日, 左上腕部の圧痛点到1% Lidocaine 7ml, Dexamethasone 1ml の局注を受け, 直後に下垂手を呈した。1978年2月2日, 手術。手術所見: 橈骨神経は左上腕外側に約10cmにわたり高度な癒痕化を認め, 注射の刺入部と思われる附近は切断に

近い状態であった。端々吻合を施行した。術後8カ月目に手指の伸展も充分可能となり良好な結果を得た。

薬剤注射による末梢神経麻痺の発生機序としては神経毒によるもの, 注射針による神経線維の機械的損傷, 神経幹内の血管の損傷および血腫形成による障害, 神経幹内への薬剤注入による内圧亢進の結果の血行障害, 神経鞘内外の癒痕組織による癒着, 絞扼によるものなど種々の要因が考えられる。以前よく発生したインガピリン注射による麻痺は最近みられなくなり, 抗生剤注入による注射麻痺が増加してきた。一方steroid剤と局所麻酔剤混注は比較的安全と考えられ, 圧痛部などに気軽に広く行なわれるようになった。そのために注射麻痺が発生するようになったことは見のがすことのできない事実である。steroid剤と局所麻酔剤との混合注射により発生したと考えられる興味ある注射麻痺の2症例を経験したので文献的考察を加えて報告した。