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Total Paralysis of the Hand after Pneumatic Tourniquet: About A Case and Review of the Literature

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Abstract **Case Report**

The pneumatic tourniquet is widely used in orthopedics to obtain a bloodless surgical field, however it can sometimes lead to severe complications. We report in this work a case of total paralysis of the hand after use of the pneumatic tourniquet in 32 years old patient who was operated for a simple fracture of the right olecranon.
Keywords: Paralysis, hand, pneumatic tourniquet.
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INTRODUCTION

Pneumatic tourniquet is widely used in orthopedic and traumatological surgery, it is an interesting tool to obtain a bloodless surgical field, it makes easier the visualization of anatomical structures and the running of operating times, especially microsurgical ones. However, it can be responsible of side effects and complications; locally, the tourniquet, because of compression and ischemia, is responsible for muscular, vascular and nervous suffering [1-3]. In general, the tourniquet increases the risk of thromboembolic and septic complications [4, 5]. The most common nerve damage of tourniquet is muscle weakness and dysaesthesia, it is exceptionally paralysis or anesthesia. We report in this work a case of total paralysis of the hand with anesthesia, following the use of the pneumatic tourniquet.

OBSERVATION

This is a 32-year-old patient, with no specific history, who has fallen on his right elbow, resulting in pain and total functional impotence of the right upper limb. The patient was admitted to the emergency department of the military training hospital Mohammed V, the examination noted an attitude of the trauma of the right upper limb, with ecchymosis in the elbow without cutaneous opening. Palpation was painful, pulse was present and neurological examination of the right upper limb was normal. The radiography of the elbow showed a simple and displaced fracture of the right olecranon (Figure 1).

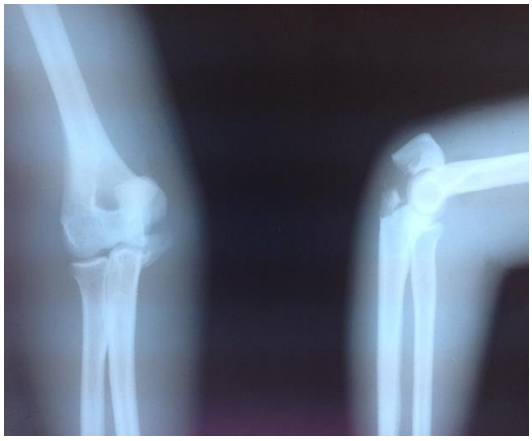

Fig-1 : Radiograph of the right elbow, showing the fracture of the olecranon

The patient was admitted the next day to the operating room, under general anesthesia, placed in left lateral decubitus, pneumatic tourniquet at the root of the right upper limb inflated to 250 mmhg. The posterior approach was used centered on the olecranon, the reduction was obtained without difficulty, the osteosynthesis technique was tension band wiring. After closure of the wound, the tourniquet was deflated. The time of the tourniquet was approximately 2 hours.

At day 1 postoperatively, the patient presented a total paralysis of the hand, with tingling and loss of tactile sensitivity in the territory of the 3 nerves of the hand. The electromyogram showed neurapraxia of the 3 nerves: radial, ulnar, and median. In addition, the wound was clean, the drain returned 100 cc and the pulse was present, the radiological control was satisfactory (Figure 2).

Fig-2: Lateral Radiograph of the surgical treatment by tension band wiring

The evolution was marked by the persistence of paralysis and anesthesia for 2 months, with an important amyotrophy of the hand. After 2 months there was a recovery of the sensitivity of the hand in different territories, and 1 month later the patient was able to recover a normal mobility of the hand (Figure 3).

Fig-3: Images showing the motor recovery of the hand after 3 months

DISCUSSION

The tourniquet was presented for the first time by the surgeon Jean Louis Petit at the Royal Academy of Sciences in Paris in 1718. Then appeared the Esmarch elastic band used by Von Johan Esmarch in 1873. The evolution in the form of pneumatic tourniquet was described by Harvey Cushing in 1904. Since then, the tourniquet is widely used in orthopedic and traumatological. But local (cutaneous, muscular, nerve, vascular) and general (thromboembolic, septic, pulmonary, cardiac) side effects weren't recognized until 1940 [6]. The nerve lesions of the tourniquet are most often benign, such : pain, muscular weakness, and paresthesia. Generally it regresses in a few months [7]. Serious nerve damage with paralysis is rare (0.15%) [8]. The largest series was presented by Eckhoff which gather 14 cases from several centers in the United States. In his series, paralysis only affected the upper limb, the radial nerve was the most affected, and the sensory trouble were minor and regressed more rapidly than the motor deficit [9]. In our case the paralysis also concerns the upper limb, but it was total concerning the radial, median and ulnar nerve. Sensory trouble were

more marked with loss of tactile sensitivity in the territory of the 3 nerve. This sensory deficit, as in the Eckhoff series, disappeared more rapidly (2 months) than the motor deficit (3 months).

According to the studies, the nerve damage is secondary to the hyperpression caused by the tourniquet [10], the severity of lesions is closely correlated with the inflation pressure and time of the tourniquet [11. Some risk factors of paralysis after tourniquet have been reported, such as advanced age, obesity, high blood pressure and atherosclerosis [12]. Our patient did not have any of these risk factors.

Therapeutic methods for nerve complications of the tourniquet are limited, they consist of a functional treatment to avoid joint stiffness and musculotendinous contractions, and the use of splints adapted to the position of hand function. So it's important to follow some preventive measures: reflected indication, adapted and well maintained equipment, the lowest possible occlusive pressure and the shortest possible duration [13].

Conclusion

The pneumatic tourniquet is a valuable aid to obtain a bloodless surgical field. However, it can be responsible of some side effects and sometimes severe complications, especially in case of inappropriate or prolonged use. It is necessary to establish a rigorous protocol of use, and to analyze the causes of any incident observed after tourniquet, in order to limit the deleterious effects.

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