

# MANAGEMENT AND RESULTS OF EXTENSIVE VOLAR WRIST LACERATIONS: "THE SPAGHETTI WRIST" IN 124 PATIENTS DURING A 5 YEAR PERIOD IN 15<sup>TH</sup> KHORDAD HOSPITAL TEHRAN

PARVIZ MAFI, M.D.,\* AND HADI BEIKPOUR., M.D.

*From the Dept. of Plastic & Reconstructive Surgery, Shahid Beheshti University of Medical Sciences, 15<sup>th</sup> Khordad Hospital, Tehran, I.R. Iran.*

## ABSTRACT

**Background:** Spaghetti wrist is a sharp volar wrist laceration in which at least 10 structures, including tendons, at least one major nerve and usually one major vessel are divided. These injuries are usually accompanied with severe permanent complications. The aim of this study was to evaluate the spaghetti wrist injury in Iran and find ways to decrease complications and obtain better results.

**Methods:** This study was done during a 5- year period between March 1999 and March 2003 in the Department of Plastic and Reconstructive Surgery of 15<sup>th</sup> Khordad Hospital, Shahid Beheshti University Medical School, Tehran, in the subset of 30 patients available for follow-up examination.

**Results:** This study reviewed 124 patients with "spaghetti wrist" lacerations. All injuries were sharp lacerations. A total of 115 men and 9 women, average age 24.5 years (range 8 to 62 years) sustained spaghetti wrist injuries. The most commonly injured hand was the right hand (74.9 percent). The most frequently injured tendons were third and fourth FDS (98.3 percent). The ulnar nerve was more commonly injured than the median nerve. The ulnar artery was more commonly injured than the radial artery.

In the subset of 30 patients available for follow-up examination, range of motion was excellent in 14 patients and good in 8 patients. Intrinsic muscle recovery was good in 9 patients and fair to poor in 21 patients. Sensory return was disappointing: 17 patients recovered only protective sensation and 13 patients demonstrated return of two-point discrimination that ranged from 7 to 13 mm in 10 patients and from 2 to 6 mm in 3 patients.

**Conclusion:** Generally recovery of function in "spaghetti wrist" after repair is not satisfactory. In order to obtain better results accurate repair of injured structures, early movement, appropriate physiotherapy and patient co-operation are required.

*MJIRI, Vol. 20, No.1, 5-7, 2006.*

**Keywords:** Volar, Spaghetti wrist, Flexor, Intrinsic.

## INTRODUCTION

Treatment of extensive wrist injuries has always been a challenge throughout history for hand and reconstructive surgeons.

Spaghetti wrist is a volar wrist laceration in which at least ten structures including tendons, at least one major nerve and usually one major vessel are disrupted.

Generally, there are different definitions for spaghetti wrist. In this study, we chose the Pockett-Meyer definition.

That is, from structures in the wrist at least ten are injured completely, including a major nerve.

This study was done in 15<sup>th</sup> Khordad Hospital, Tehran, Iran. The data, surgical treatment, approaches and results are compared with other centers.

\* Email: pmafi@aol.com

## MATERIAL AND METHODS

This is a retrospective study from March 1999 till March 2003 in 124 patients with spaghetti wrist in 15<sup>th</sup> Khordad Hospital of Shahid Beheshti University.

All injuries were sharp lacerations between the distal wrist crease and the flexor musculotendinous junction (zone 5).

Fractures, crush injuries and avulsive injuries were excluded.

Patients were classified according to age, gender, type of injury, condition of sensation and function.

Function was grouped as excellent, good, fair & poor; Excellent: function of tendon 85% or distance from fingertip to distal palmar crease < 1cm.

- good: function of tendon 70-84% or distance from fingertip to distal palmar crease < 2 cm.

- fair: function of tendon 50-69%.

- poor: fixed contractures or adhesions.

Sensory tests included light touch, pinprick and moving two-point discrimination test.

The mean follow-up for thirty patients in the study was 2 years.

### Operative technique

The patients were kept in supine position. After appropriate anesthesia and use of tourniquet, the wounds were extended in longitudinal and transverse directions. The structures were explored. The disrupted tendons were repaired with 4/0 nylon with modified Kessler method. The disrupted nerves and arteries were repaired with 8/0 nylon under loupe magnification. Ligation of twelve ulnar and fifteen radial arteries had been done due to severe injury in other centers.

After surgery the hands and wrists had been splinted dorsally with 15 degrees wrist flexion, 20 degrees MP flexion and fingers in full extension.

The splint was used for 45 days. The motion of fingers was begun in the second postoperative day with passive flexion and active extension.

## RESULTS

There were a total of 115 men (92.8 percent) and 9 women (7.2 percent). (Table I). Their mean age was 24.5 years. Their age ranged from 8 to 62 years.

The most frequent mechanisms of injuries were:

glass laceration 81 patients (65.3%),

knife wounds 21 patients (16.2%) and

others 22 patients (17.7%).

Right hand involvement was 75% and the left was injured in 25% of cases.

The most frequently injured tendons in order were:

1. FDS 3, 4 (98.38%)

2. FDS 5 (96%)

3. FDS 2 (91%)

4. FCU & FDP 3 (90%)

5. FDP 4 (89%)

6. Palmaris longus (84%)

7. FDP 2 (82%)

8. FCR (66%)

9. FPL (48%). (Table IV)

Injury to the ulnar nerve was more common than the median nerve (ulnar nerve 85% and median nerve 70%) (Table V).

Ulnar artery injury was more common than radial artery injury (ulnar 90% and radial 25%) (Table VI).

From a total of 16 structures in the wrist the least common injury was in the radial artery with 25% involvement and the most common injury was in FDS 3&4 with 98% involvement. Synchronous median and ulnar nerve injury was present in 69 cases (55.6%). Synchronous injury in radial and ulnar arteries were in 25 cases (20%). Thirty patients were followed from 1 to 3 years. In 14 patients motion in wrist and fingers was excellent, 8 cases were good, 5 cases fair and fixed contracture was observed in 3 cases (Table VIII).

Recovery in intrinsic muscle function was good in 9 patients. Amongst them in 5 cases the ulnar nerve was intact and in 4 cases the ulnar nerve had been injured. In 21 patients recovery of intrinsic muscle function was fair to poor (Table IX).

Degrees of claw hand deformity were present in these 30 cases, 25 had ulnar nerve and 19 cases had median nerve injury. Injuries in two nerves were seen in 13 patients.

Concerning the return of sensation in the territory of the disrupted nerve, two point discrimination was 3-6 mm in 3 patients with median nerve injury and 7-13mm in 10 patients (2 patients had median nerve and 7 patients had ulnar nerve injury and 1 patient had combined two nerve injuries).

In seventeen patients with combined disruption of ulnar and median nerves, the sensation was recovered as protective. Pinch and grip strength in the injured hand was 50 percent of the normal side.

Figures 1, 2, 3 show a patient with spaghetti wrist with disruption of 16 structures.

After 8 months return of function was excellent.

## DISCUSSION

In spaghetti wrist injuries each of the three structures in zone V can become injured including twelve flexor tendons, median and ulnar nerves and radial and ulnar arteries.

At least ten structures including tendons, one nerve and usually one artery should have been disrupted to call it spaghetti wrist.<sup>1,6</sup>

In most studies results of repair of tendons have been reported as good to excellent results.<sup>1</sup>

From 30 patients, 20 had good to excellent range of motion.

In Gloria Chin's study on 60 patients with the mean age of 29, the most common cause of injury was laceration from glass and the mean number of structures injured in wrist has been 7.8.

The most common injured structure has been FCU.

The combined disruption of median and ulnar nerves has been in 23.3 percent of cases.

In 19 patients ROM has been excellent in 12 and 7 patients have been reported as good. Return of function of intrinsic muscles has been good in 7 patients and poor in 5 cases. Return of sensation in 11 patients from 19 has been in the range of protective. In 5 patients 2.P.D. was 7-12 mm and in 3 was 2-6mm.<sup>3</sup>

In another study performed by Kabak, there were at least ten injured structures. The most common injured tendon was FDS. In his study of 21 patients ROM was good to excellent in 70%. Return of hand function after disruption of the ulnar nerve was not good but the result of repair of the median nerve was much better. The results were poor when both the ulnar and median nerves had been injured.<sup>5</sup>

In Puckett et al's study in 38 patients the mean age was 22 and the most common cause was glass. The mean number of injured structures was 8.

In this study ROM in 33 patients was good to excellent. Sensation in 27 patients were evaluated, 8 had only protective sensation and 19 cases had 2PD of less than 12mm.

6 patients had return of intrinsic muscle function.<sup>2</sup> In Hudson's study on 15 patients with spaghetti wrists the result of repair was better in median nerve than ulnar nerve and most cases had good to excellent ROM.<sup>4</sup>

In our and previous other studies the most common etiology has been laceration caused by glass.

Injury of the right hand has been more common than the left hand.

FDS has been the most commonly injured tendon. In above studies and also ours the most common injured artery has been the ulnar artery.

Return of intrinsic muscle function has been better with isolated than combined injuries of both ulnar and median nerve injuries.

Return of sensation in combined disruption of ulnar and median nerves has been poorer in comparison with isolated disruption of each.

## REFERENCES

1. Green's Operative Hand Surgery. New York: Churchill Livingstone, Chap 59, Chap 43, pp. 1381-1404, 1851-1898, 1998.
2. Puckett CL, Meyer VH: Results of treatment of extensive volar wrist lacerations: The spaghetti wrist. *Plastic and Reconstructive Surgery* 75(5): 714-21, May 1985.
3. Chin G, Weinzweig N, Mead M, Gonzalez M: "Spaghetti wrist": management and results. *Plastic and Reconstructive Surgery* 102(1): 96-102, July 1998.
4. Hudson DA, DeJager LT: The spaghetti wrist: simultaneous laceration of the median and ulnar nerves with flexor tendons at the wrist. *J Hand Surg* 18B: 171, 1993.
5. Kabak S, Halici M, Baktir A, Turk CY, Avsarogullari L: Results of treatment of the extensive volar wrist lacerations. The spaghetti wrist. *Eur J Emer Med* 9(1): 71-76, Mar 2002.