

ALPHANUMERIC CODIFICATION IN COMPLEX TRAUMATIC LESIONS OF HAND DISTAL TO CARPAL BONES

Tiberiu I. Bratu, Alina Helgiu, Vladislav Gyebnar, Zorin P. Crainiceanu, Mihaela Mastacaneanu, Petru L. Matusz, Gheorghe Noditi, Daciana Grujic, Lucian Galosi, Shruti Kaushal, Viviana Olaru

REZUMAT

Introducere: Traumatismele complexe la nivelul mâinii implică leziuni ale diferitelor elemente anatomiche, ce pot fi afectate diferit în cadrul traumatismului. Strategia necesară rezolvării chirurgicale a cazului necesită un bilanț lezional complet inițial. **Scopul** acestei lucrări este de a codifica alfanumeric printr-un studiu retrospectiv, cazurile cu traumatisme complexe ale mâinii care s-au prezentat în Clinică în perioada 2006-2008. **Material și metode:** S-au codificat alfanumeric un număr de 68 de cazuri de traumatisme complexe ale mâinii. Codificarea s-a realizat conform unui algoritm care a utilizat ca elemente componente: localizarea leziunii (codificată cu cifre), elementul anatomic lezat (codificat cu litere) și descrierea leziunii (codificată cu cifra la subscript). **Rezultate și discuții:** Prin această metodă s-au codificat alfanumeric 68 de cazuri care au îndeplinit criteriile de selecție pe perioada 2006-2008 în Clinica noastră. **Concluzii:** Codificarea leziunilor la nivelul mâinii permite inventarierea tuturor leziunilor, evitând situațiile de nedepistare a unor leziuni și transformă un diagnostic lung într-un cod ușor de stocat într-o bază de date, ușor accesibil la nevoie.

Cuvinte cheie: mână, clasificare, traumatisme complexe

ABSTRACT

Introduction: Complex trauma of hand involves different anatomic elements which can be affected at different levels due to the injury. Defining a surgical treatment for such cases requires a complete initial evaluation of injury. **Aim of this study** was to use alphanumeric codification retrospectively in some cases of complex hand trauma that were treated in our Department in the period of 2006-2008. **Material and methods:** A total of 68 cases of complex hand trauma were codified through alphanumeric codification, according to an algorithm which used as components: location of lesion (codified as numbers), anatomic element affected (codified as letters) and description of lesion (subscript number). **Results and discussions:** This method was used to codify alphanumerically 68 cases of complex hand trauma which fulfilled the selection criteria from the period 2006-2008. **Conclusions:** Codification of lesions at the level of hand allows complete accounting of all lesions avoiding neglecting of any lesion initially and transforming a long diagnosis into an easily storable code in a database, which is easily accessible whenever needed.

Key Words: hand, classification, complex trauma

INTRODUCTION

Hand is comprised of many units, fingers, all of which can be influenced by a complex trauma to the hand. Thus we can have complete or incomplete amputation of a finger, devascularization and/or complex fractures of another finger. Complex traumas of hand can be defined as lesions involving more than one functionally important anatomic elements (ex. vessels, nerves, tendons, bones).¹

Most of the present classifications were used mainly in orthopedics and aimed at the bone lesions mainly in order to standardise the treatment in relation to the type of fracture. A classification including all forms of fracture was developed by Muller.^{2,3} For bone lesions of hand there is alphanumeric codification of location as well as severity of the fracture.⁴ Orthopedic surgeons have long been trying to associate along with the bone lesions a classification for concomitant soft tissue injuries without a detailed description though, only in order to individualise therapeutic options. Gustillo's classification modified in 1984, permitted an evaluation of fractures associated with soft tissue lesions.^{5,6} Later on, AO/ASIF classification detailed the soft tissue lesions grading them in five levels of severity.^{7,8}

The multitude of anatomic elements involved in such a small surface as well as the variety of lesions makes it difficult for this classification to fulfill all the

Department of Plastic and Reconstructive Surgery, Timisoara Clinical Emergency County Hospital

Correspondence to:
Dr. Alina Helgiu, 10 Dr. I. Bulbuca Blvd., 300736 Timisoara, Tel. +40-749-053853
Email: alinahelgiu@yahoo.fr

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demands for a hand surgeon a detailed and precise description of all lesions along with their severity is compulsory for decision regarding treatment options.⁹ Likewise for research, any comparative study requires a comparison within the same category which involves existence of clear formed notions about these categories.

The purpose of this study is to codify the lesions according to an alphanumeric codification based on their location and severity, included in fact into a diagnostic study.

MATERIAL AND METHODS

We performed a retrospective study on 68 patients with complex hand trauma distal to the carpal bones treated in our clinic between 2007-2008, by codifying their lesions according to the algorithm hence mentioned. Alphanumeric codification was done according to :

- Initial examination (according to a standard examination chart);
- Initial photographs (all clinical cases in casa austria are pictured);
- Radiographs.

Alphanumeric codification was done including as components: (Table 1)

- Location of the lesion;
- Anatomic element involved;
- Severity of the injury.

For the same digital ray, multiple lesions for the same anatomic element are codified separately for each location.

Amputation is codified only for vascular system.

Tendon lesions

- T₁ - partial section of a tendon;
- T₂ - complete section of a tendon;
- T₃ - tendon defect/dilaceration;

Location of tendon lesions

It is codified with two numbers, first representing the type of tendon and the second representing the zone of tendon affected.¹⁰

- 1 - Extensor tendon:
 - 1 - proximal to PIPJ;

- 2 - distal to PIPJ;

2 - Deep flexor:

- 1 - Zone 1;
- 2 - Zone 2;
- 3 - Zone 3;

3 - Superficial flexor.

Nerve lesions

- N₁ - Contusion
- N₂ - Complete sectioning
- N₃ - Nerve defect

Location of nerve lesions

It is codified with two numbers: 1 for digital nerve and second number representing radial(1) or ulnar (2) border. For motor branches of median and ulnar nerves numbers 2, 3 are used respectively.

- 1 - digital nerve;
- 1 - ulnar border;
- 2 - radial border;
- 2 - recurrent branch median nerve;
- 3 - deep branch of ulnar nerve.

Vascular lesions

- V₁ - without devascularisation;
- V₂ - with devascularisation;
- V₃ - amputation.

Location of vascular lesions

Codification is done as for the bone lesions.

Osteoarticular system

Diaphysis fractures are codified as:

- A₁ - simple fracture;
- A₂ - comminutive Fracture;
- A₃ - bone defect.

Joint lesions are codified as:

- C₁ - closed luxation;
- C₂ - open luxation;
- C₃ - intraarticular fracture;
- C₄ - joint surface defect >75%.

Location of fracture or joint lesion

Location of fracture is codified in two numbers, first representing the segment of the bone with respect to the digital ray (0 for metacarpal, 1 for phalanx 1, 2 for F2 and 3 for F3).⁴

Table 1. Elements for alphanumeric codification.

Ray	Osteoarticular system		Vascular system		Nervous system		Tegument		Musculotendinous system	
	Location	Lesion	Location	Lesion	Location	Lesion	Location	Lesion	Location	Lesion

Second number represents the portion of bone affected: proximal 1, middle 2, distal 3.

Skin and its appendages

Cutaneous open lesion (integument open):

- IO₁ - wound <2 cm;
- IO₂ - wound > 2cm;
- IO₃ - small skin defect;
- IO₄ - large skin defect.

Cutaneous closed lesion (integument closed):

- IC₁ - contusion without dilaceration;
- IC₂ - abrasion, circumscribed decolation;
- IC₃ - extensive decolation, closed;
- IC₄ - necrosis due to contusion on whole thickness.

Location of skin lesions:

- 1 - palmar surface:
 - 1 - mid-palmar;
 - 2 - fingers till pulp ;
 - 3 - pulp;
- 2 - dorsal surface:
 - 1 - hand;
 - 2 - fingers till nail complex;
 - 3 - nail complex.

EXAMPLES:

Case 1:

Diagnosis: Complex trauma through torsion-contusion(chainsaw), left hand (nondominant) with incomplete amputation at F1 index finger, devascularisation injury of middle finger mid-palmar, incomplete diaphysis fracture of III metacarpal bone, section of FDP middle finger zone 3, section of FDS middle finger, section of common digital nerves for web space II and III and superficial palmar arcade, mid palmar wound from ray II - ray IV.

Case 2:

Diagnosis: Complex trauma through gunshot injury with fracture metacarpal bone III, and bone defect metacarpal bone II, soft tissue defects of right hand (dominant).



Figure 1. Case 1 in emergency.



Figure 2. Radiographs of case 1 in emergency.

Table 2. Codification of case 1.

Ray	Osteoarticular system		Vascular system		Nervous system		Tegument		Tendon system	
	Location	Lesion	Location	Lesion	Location	Lesion	Location	Lesion	Location	Lesion
II			1,1	V ₃						
III	0,3	A ₁	0,3	V ₂	1,1	N ₃	1,1	IO ₂	2,3	T ₂
					1,2	N ₃			3,0	T ₂
IV			0,1	V ₁	1,1	N ₃	1,1	IO ₂		
V							1,1	IO ₂		

Table 3. Codification of case 2.

Ray	Osteoarticular system		Vascular system		Nervous system		Tegument		Musculotendinous system	
	Location	Lesion	Location	Lesion	Location	Lesion	Location	Lesion	Location	Lesion
II	0,2	A ₃	0,2	V ₁			2,1	IO ₄	1,1	T ₃
III	0,2	A ₁	0,2	V ₁			2,1	IO ₄	1,1	T ₃



Figure 3. Case 2. Radiography and initial aspect emergency.

RESULTS

Through codification of the 68 cases we concluded that in 17 cases two digital rays were affected, 22 cases were with involvement of a single digital ray, 5 cases with thumb involvement, 23 cases with injuries to 3 digital rays, 3 cases with 4 rays and one case with involvement of all digital rays.

Out of these 68 cases maximum severity for vascular system (amputation) was noted in 14 cases, maximum severity for bone lesions (bone defect) was noted in 2 cases, maximum severity for skin lesions (large skin defect) in 4 cases. Most frequent associations were dorsal skin/extensor tendon/fracture in 23 cases (3 cases with same association in multiple rays), skin/tendon in 21 cases, skin/nerve in 20 cases, bone/nerve/tendon in 12 cases, devascularisation in 8 cases.

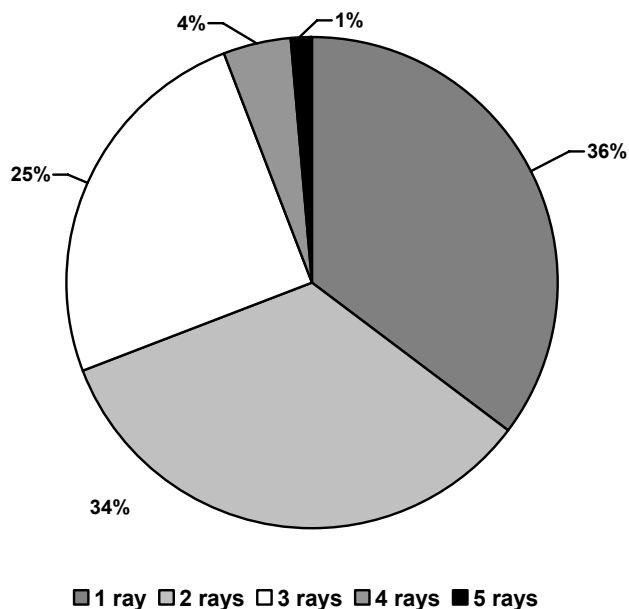


Figure 4. Distribution according to number of rays involved.

Association of bone defect/tendon defect/large skin defect was noted in two cases and devascularization/skin defect/nerve defect in one case.

DISCUSSION

Evaluation of complex trauma of the hand is a difficult issue because comparison to existing classifications, is generally unsatisfactory to the complexity of hand as a functional unit comprising of many segments (fingers).^{1,2,4} Possible combinations of segmental lesions as well as the severity of lesions for each segment make it possible to compare them with general categories. Alphanumeric codification is an attempt to standardise the diagnosis in unitary pattern so as to have identical categories useful for comparative studies. In literature, there is HISS system for comparing the severity of hand trauma but the diagnosis system does not satisfy all the needs.¹⁰⁻¹²

Present system of codification is a diagnosis system trying to include all the anatomic elements into a classification similar to Muller's for osseous system.⁴ This alphanumeric codification system can be saved in a data base with well established parameters which can later be used in comparative studies, as is the current

trend for fractures.¹³

Current alphanumeric codification is an adaptation of existing classifications. Thus for the osseous system Muller's classification was used as the model while for soft tissues lesions used for HISS were modified and AO/ASIF classification of soft tissue lesions was adapted.^{14,15} Muller's classification offers a complete system of classification of fractures for orthopedic surgeons, thus elaboration of a similar system of classification of soft tissue lesions becomes essential. This codification system can be computerised so we can follow the underlying parameters: location, type of lesion and their severity. This makes it possible to perform comparative studies on any one of the parameters. Acknowledging the severity and anatomic complexity of hand laboring such a classification becomes highly useful.

CONCLUSIONS

Alphanumeric codification is a new tool as inventory of location of lesions, severity of lesions, as well as the anatomic elements affected allowing the hand surgeon to have a concise and codified diagnostic formula, as well as the possibility of stocking and fast access to the information related to complex hand trauma through a data base.

This codification system allows a complete evaluation of all the lesions and their utility in comparative studies. Thus, if we have a database according to the system hereby presented (alphanumeric codification) parameters like: number of digital rays involved, ray involved, type of lesion and especially the severity of lesions and their associations can be easily compared.

Present codification system offers possibility of rapid transmission of information between various health centres and thus refer the cases to the centres where they can be treated.

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