Contribution to the Identification of Burns According to Depth and Severity (Global and Regional) and to Formulation of Presumptive and Definitive Diagnosis and Prognosis

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INTRODUCTION

I have been interested in the subject of identification of burns according to their depth and severity (global and regional) for many years, and my proposal is directed to obtain a more accurate diagnosis (with "presumptive" meaning on admission and "definitive" meaning when the patient is discharged from the hospital). This accuracy of classification can be used in statistical studies (on mortality rates and other factors), in which it is necessary to perform a thorough reference to those aspects of the burn problem. Here, I have presented those elements taken into consideration to fulfill my purpose.

Depth Classifications

International reports[1-9] have shown various depth classifications of burns, which have used the word "degree" and numbers to identify depth, leading to problems because the same degree and number can mean different depths according to each classification (Table 1).

To avoid such confusion, I have proposed[10] a new way to designate burn depth that utilizes letters instead of numbers and "types" instead of "degrees." Type "A" represents superficial burns (epidermal and superficial dermal), with 2 subgroups (erythema and blister); type "B" represents full thickness burns; and type "AB" represents intermediate or deep dermal burns.

With their evolution, type "AB" burns may turn into "AB-A" when they heal spontaneously or into "AB-B" if they deepen and require skin grafting.

I have also added type "C" to represent those burns (electrical or others) that destroy tissues under skin (muscles, tendons, vessels, nerves) and need flap procedures for their treatment. Examples are shown in Table 2 (with illustrations shown in Figure 1, Figure 2, Figure 3, and Figure 4).

Severity Evaluation And Diagnosis

Global severity diagnosis

Global severity is evaluated with considerations of extension and depth, plus age, and previous and concomitant pathologies**.** It is divided into 5 groups, identified with Roman numbers. Group I represents minor, group II represents moderate, group III represents severe, group IV represents high severity, and group V represents critical.

Table 3 displays the classification of burn severity according to depth and extension of each group. Examples of groups are shown in Figure 5 (I "A" [minor]), Figure 6 (I "B" [minor]), Figure 7 (II "AB" [moderate]), Figure 8 (II "B" [moderate]), Figure 9 (III "B" [severe]), Figure 10 (IV "B" [high severity]), and Figure 11 (V [critical]).

I have proposed a new way to synthesize the global diagnosis, which consists of drawing a horizontal line and placing above it the percentage of total body surface burned and

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TABLE 1. Depth Classification of Burns According to Dupuytren and Boyer

Degree	Dupuytren (1839)[2]	Boyer (1844)[3]
First	Erythema	Erythema
Second	Blister	Blister
Third	Partial dermis	Full thickness
Fourth	Total dermis disorganization	
Fifth	Muscles	
Sixth	Bones	

TABLE 2. Depth Classification of Burns According to Benaim

Type of Burn	Burn Depth		Example
A	Superficial (epidermal and superficial dermal)	Erythema	Figure 1 A
		Blister	Figure 1 B and C
AB	Intermediate or deep dermal		Figure 2
B	Full thickness		Figure 3
C	Tissues under skin destroyed		Figure 4

FIGURE 1. Type "A" Superficial Burns. A, Erythema; B, Blister; C, Blister Histological Image

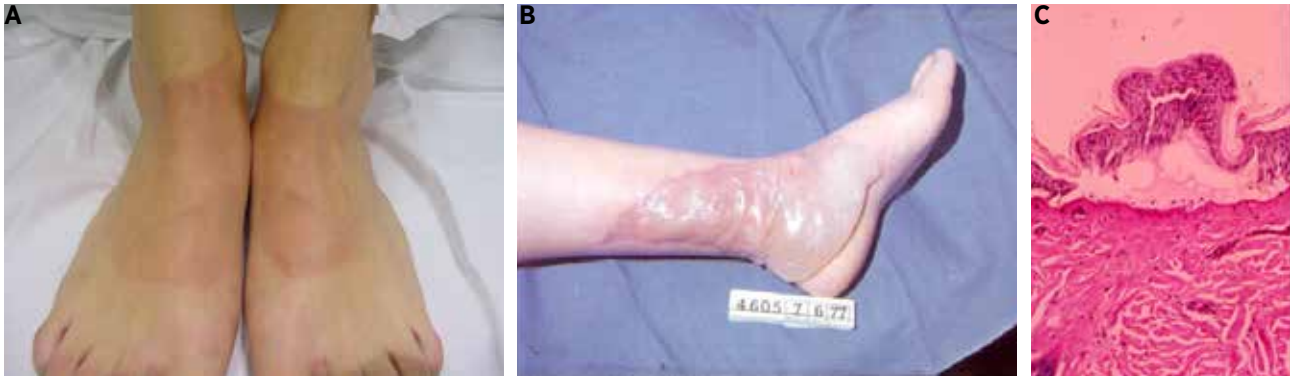
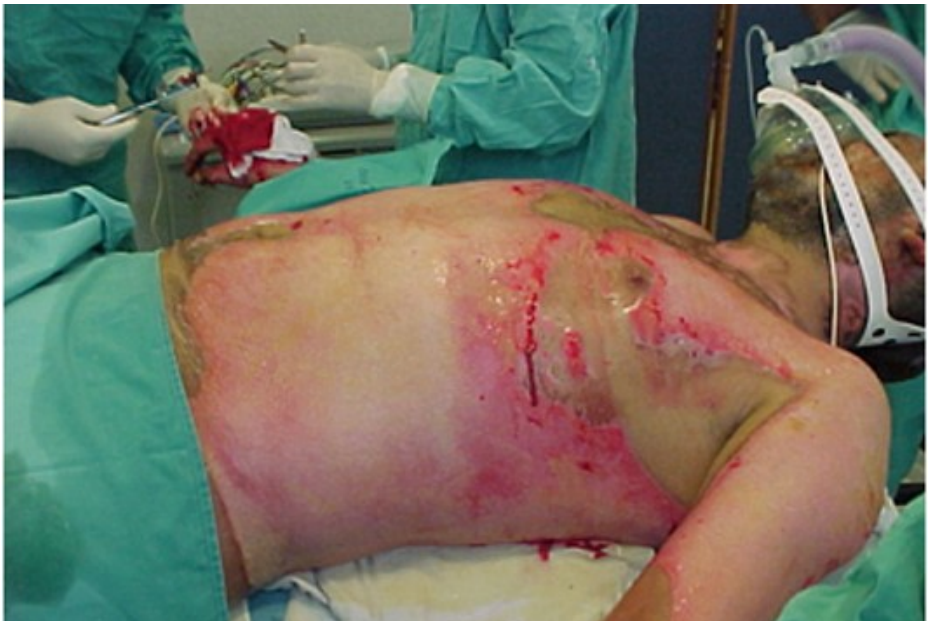


FIGURE 2. Type "AB" Burn (Intermediate, Deep Dermal)



below it the percentage of body surface of each type of burn:

Total Body Surface Burned.....%

A: .....% ; AB: .....% ; B: .....% ; C: .....% **: Severity Group**

Then, by consulting Table 3, we obtain the severity group. To facilitate the identification of this proposal, we have named this as "code."

Regional severity diagnosis

Regional severity is evaluated according to localization, depth, and the possibility of sequels and is also divided into in 5 groups identified by Roman numbers. However, to differentiate them from those of global severity, an "X" is placed before the numbers. Table 4 shows these groups.

Figure 12 (I "A," no sequel), Figure 13 (X-II, esthetic sequel), Figure 14, top (X-II "B," neck functional sequel) and Figure 14, bottom (neck retraction treated with free flap), Figure 15 (forearm burn X-IV "C," with destroyed tissues under skin causing tendon and nerve exposition), Figure 16 (X-V "C," upper and lower extremities with destroyed tissues and amputation), and Figure 17 (facial X-V "C," total facial disfigurement) show examples.

Presumptive And Definitive Diagnosis

Global and regional diagnosis may be presumptive or definitive. Global presumptive diagnosis (GPD) and regional presumptive diagnosis (RPD) are formulated on admission of the patient, when burn type "AB" has not yet

TABLE 3. Groups of Global Severity

Type of Burn	Percent Total Body Surface Burned				
	Group I, Minor	Group II, Moderate	Group III, Severe	Group IV, High Severity	Group V, Critical
"A," superficial	Up to 15%	16% to 35%	36% to 70	71% to 90%	More than 90%
"AB," intermediate	Up to 5%	6% to 45%	46% to 60	61% to 75%	More than 75%
"B," full thickness	Up to 1%	2% to 5%	6% to 30	31% to 60%	More than 60%
"C," tissues under skin destroyed		Up to 1%	2% to 5%	6% to 10%	More than 10%

TABLE 4. Groups of Regional Severity

Type of Burn	Group X-I, Minor	Group X-II, Moderate	Group X-III, Severe	Group X-IV, High Severity	Group X-V, Critical
"A," superficial	No sequel				
"AB," intermediate		Esthetic sequel/ scar			
"B," full thickness			Functional sequel/ retraction		
"C," tissues under skin destroyed				Partial mutilation	Total mutilation

FIGURE 3. Type "B" Burn (Full Thickness)

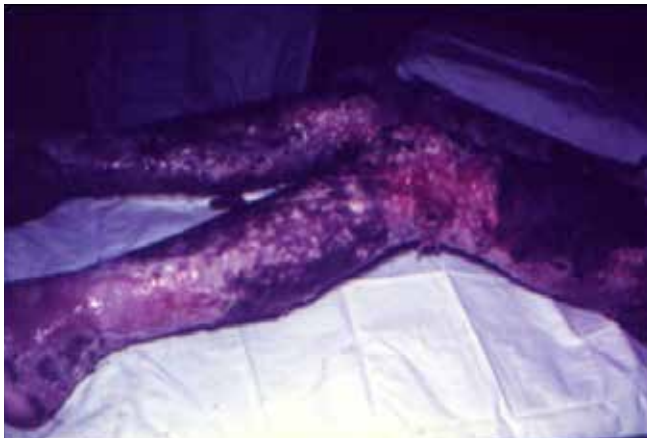


FIGURE 4. Type "C" Burn With Destruction of Subcutaneous Tissues (Muscles, Tendons, Vessels, Nerves)

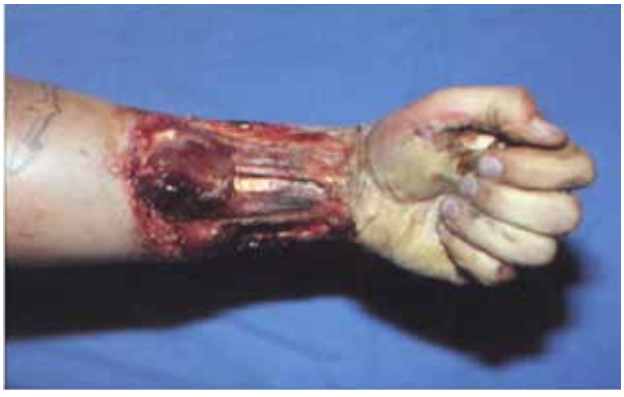


FIGURE 5. Group I "A" Burn (Minor, Superficial)

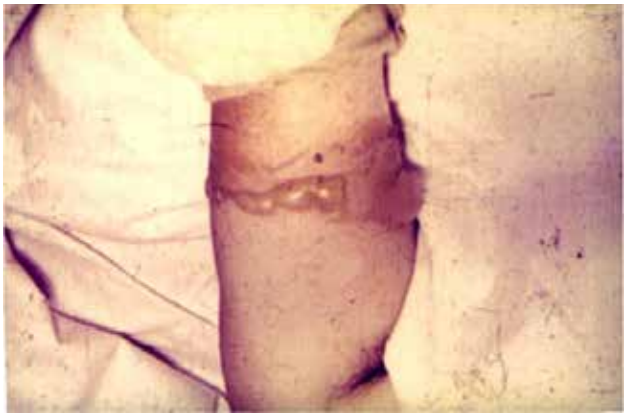


FIGURE 6. Group I "B" Burn (Minor, Full Thickness)

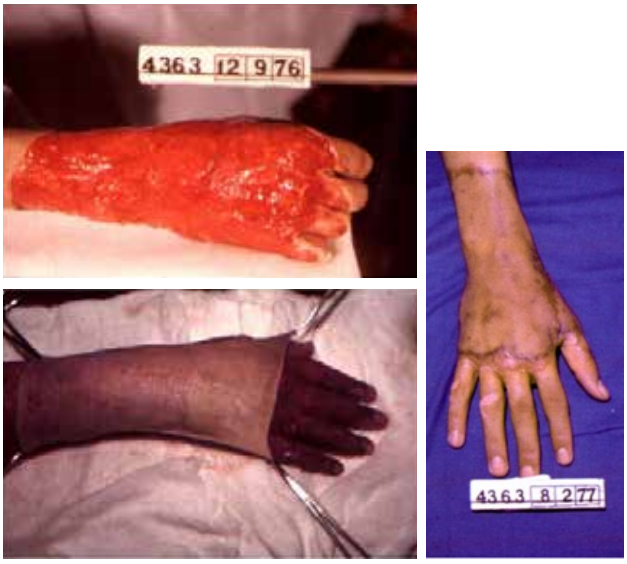


FIGURE 7. Group II "AB" Burn (Moderate, Deep Dermal)

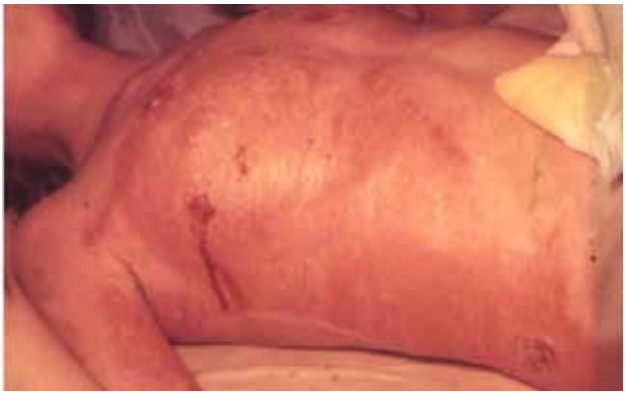
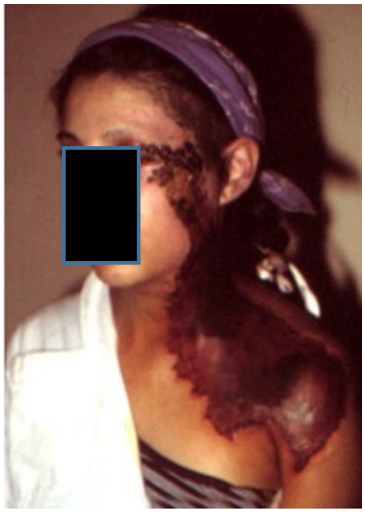
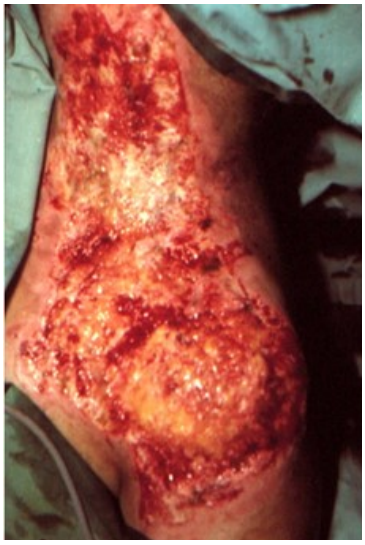


FIGURE 8. Group II "B" Burn (Moderate, Full Thickness)





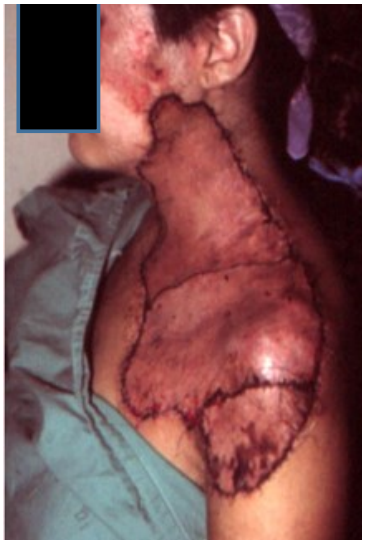


FIGURE 9. Group III "B" Burn (Severe, Full Thickness)

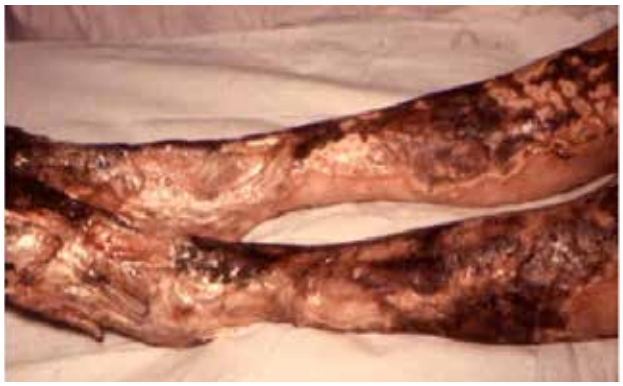


FIGURE 10. Group IV "B" Burn (High Severity, Full Thickness)

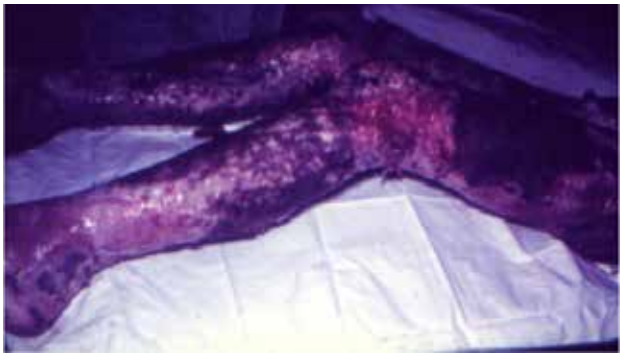


FIGURE 11. Group V "B" and "C" Burns (Critical)

FIGURE 12. Facial Burn Classified as Group X-I "A" (Superficial, No Sequel)

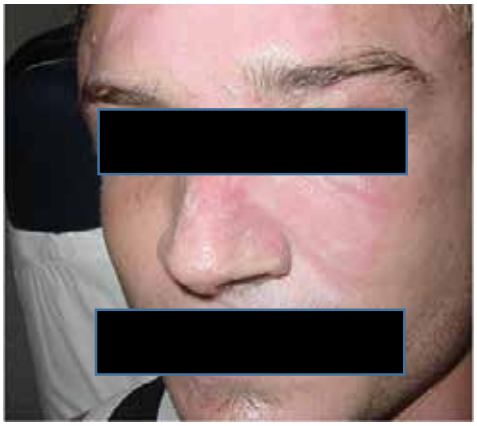
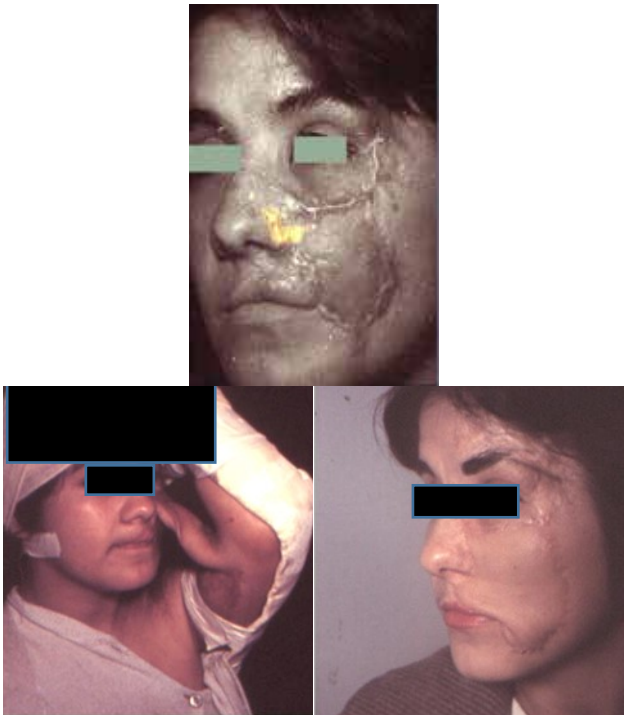
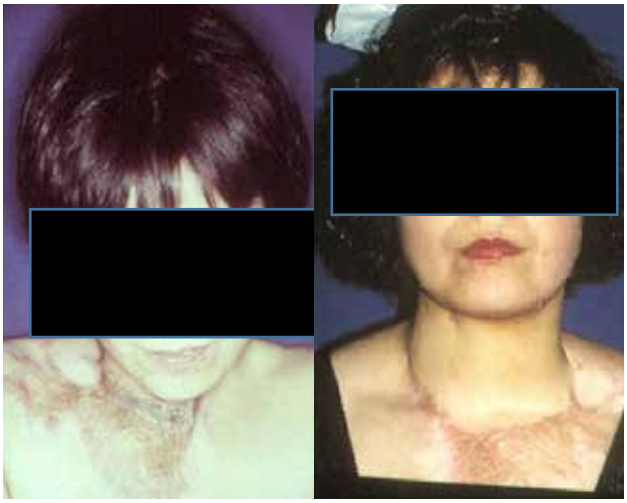


FIGURE 13. Facial sequel of Type "B" grafted burn: Graft Hyperpigmentation. Peripheric Hypertrophic Scars.



Bottom Right image shows facial esthetic burn sequel treated with arm flap (Tagliacozzi technique).

FIGURE 14. Neck Burns Classified as Group X-II "B" (Functional Sequel)



(Left) Neck retraction. **(Right)** Neck retraction treated with free flap.

FIGURE 15. Forearm Burn Classified as Group X-IV "C" (Subcutaneous Tissue Destruction, Including Muscles, Tendons, Vessels, Nerves)

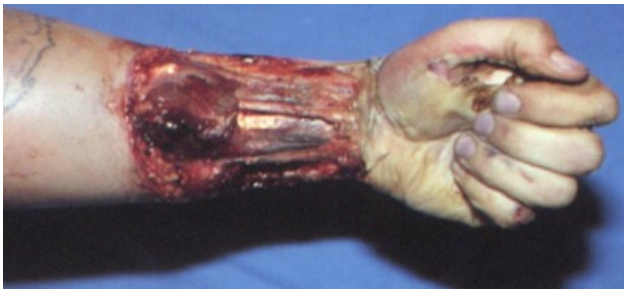


FIGURE 16. Extremities Burn Classified as Group X-V "C" (Amputations)

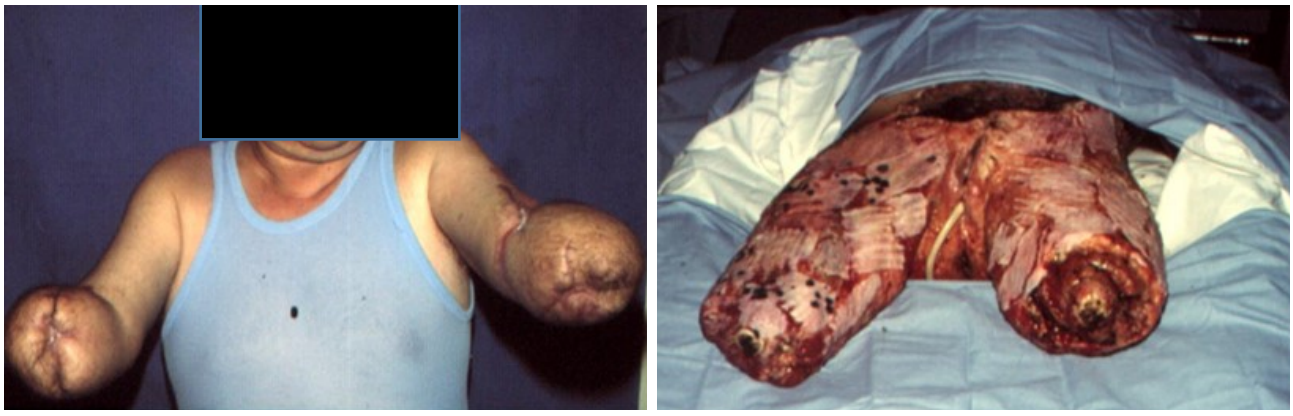
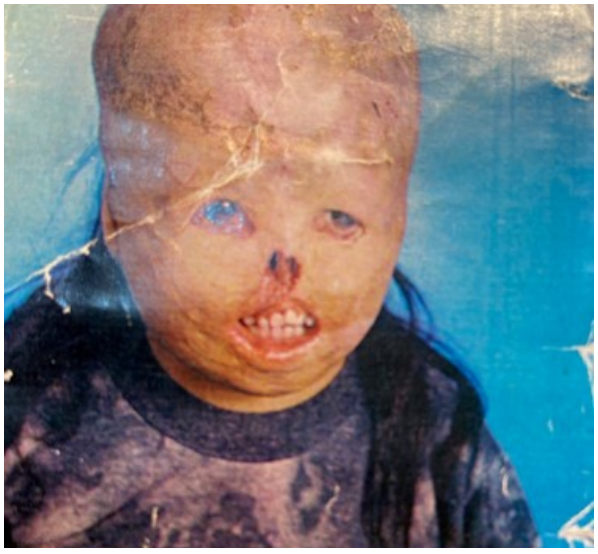


FIGURE 17. Facial X-V Burn (Total Disfigurement)



evolved and when it is not yet possible to know whether the injuries will heal or deepen and whether there will be a need for skin grafting.

As soon as their evolution is defined, the injury can be classified for example as "AB-A" or "AB-B," and the global and regional diagnosis can be formulated as definitive (GDD and RDD).

Prognosis

Prognosis may also be qualified as presumptive or definitive, taking into consideration the same factors that were previously described.

Personal Experience

In 1948, a group of patients with burns resulting from a home fire arrived at the "Cosme Argerich Hospital" Buenos Aires, Argentine, my country. The head of the Surgical Department, where I worked, entrusted me to take care of them. Those were the first patients with type "B" burns who I treated with skin grafts and inspired me to create the first burn center at the Hospital.

In 1952, as result of experiences obtained during the 4 years of treating burns, I presented my doctoral thesis[11]; in 1956, I was designated as the Director of the National Burn and Reconstructive Surgery Hospital in Buenos Aires (later called "Burn Hospital").

I worked at the Hospital until 1984 (28 years). During this period, I had the opportunity to try our classification of depth of burns, to put the "code" in use, and to evaluate global and regional severity in their 5 groups, with very satisfactory experience.

In 1960, I communicated for the first time at an international level this way to evaluate burn severity. Part of the publication,[12] in which I mentioned my table to evaluate global burn severity according to its extension and depth, was presented at the "First International Congress of Research in Burns" held in Bethesda, Maryland, USA. This meeting was organized and presided over by Dr. Curtis Artz. The paper was published in the book *Burns*, which was edited by Dr. Artz.

In 1963, I presented at the "Third International Congress of Plastic Surgery" held in Washington, DC, where I presented a "Commentary On Our Experience of 40 000 Cases of Burns Cared for at our National Institute for Burns" and presented again our way of burn classification.[13]

In 1970, the "Third International Congress of Burns" was held in Prague. A special session was dedicated to discussing burn depth classifications, where I presented my paper[10] as a contribution to this important topic. Several participants presented their own ideas; regrettably, there was no agreement on this matter, which remained without solution.

In 1981, I created the Benaim Burn Foundation; in 1997, by means of an agreement with the German Hospital,

the Foundation installed its "Excellence Center for Burn Assistance" as the fourth stage of the Hospital. Here, we employ our identification system of burn depth and the evaluation of severity in groups.

Utility of the System

For over 60 years, our Hospital has been successfully using this system to register data in patient charts. This system has allowed us to carry out statistical work, with regard to mortality rates and other factors, by dividing patients into severity groups to facilitate the analysis of the results and to compare groups of the same complexity.[14] Several countries from Latin American have adopted this system. An aim of this presentation and study is to invite burn services from this geographical area to provide their opinions on this system.

SUMMARY AND CONCLUSSIONS

This burn depth proposal allows a more precise identification of types of burns. The use of letters instead of numbers and types instead of degrees helps to avoid confusion when degree classification is used.

Severity evaluation is considered as global and regional. Global severity is evaluated in 5 groups, according to their extension and depth: I (minor), II (moderate), III (severe), IV (high severity), and V (critical). The global diagnosis code allows complete information on extensions and depths of each case.

Regional severity according to depth and localization is also designated into 5 groups, depending on its localization, depth, and the possibility of sequels: X-I (no sequels), X-II (esthetic sequel), X-III (functional sequel), X-IV (partial mutilation), and X-V (total mutilation).

Diagnosis is divided into presumptive and definitive, according to the evolution of "AB" percentage, where presumptive is diagnosis on admission and definitive, when the "AB" burn has evolved as "AB-A" or "AB-B," is diagnosis on patient discharge from the hospital. Similarly, prognosis is also divided into presumptive and definitive.

This proposal of a new way to identify burns and their severity can allow more precision for statistical work (eg, morbidity and mortality rates), giving the possibility to study separately each group and to obtain more specific scientific information.

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