EPIDEMIOLOGY OF BURN WOUNDS IN PEDIATRIC PATIENTS ADMITTED AT THE EMERGENCY CHILDREN'S HOSPITAL OF CLUJ NAPOCA

Doina Elena Zamora[1], I Paraian[2], H Gocan[2], Simona Barsan[1]

Abstract

The thermal injury and the subsequent burn wound represents one of the great challenges of trauma. The present study addresses the causes and extent of thermal injuries affecting a specific group of the pediatric population: infants and toddlers. This particular group is prone to accidents and abuse being in the direct care of adults, their parents [1].

The 105 pacients aged between 0 and 3 years were admitted in our department over a period of 5 years.All the pacients have met the internationally recognised criteria for hospitalization and were categorized based on type of thermal injury, depth of the wound, body surface affected, gender and living environement.Within the studied group we foud a prevalence of burns caused by scalding mostly localized at the head, neck, chest and lower extremity.There was a slight prevalence of male subjects. Also most of our pacients originated from challenging social environnements.

The findings of this research are consistent with those published in literature, regarding mechanism, gender, surface and social background [1,2,3,4].

Key words: pediatric patient, harming agent, thermal injury, total body surface, degree of burn wound

Introduction

The thermal injury occurring in the early childhood period encounters a specific biological and immunological terrain, having as a result some particularities regarding treatment and outcome. The immature organism is extremely sensitive to any minor unbalance but it presents also extraordinary healing and recovery capabilities, superior to the adult.

The types of burns and the events preceding the injury are somehow specific in this age category, sometimes raising the doubt if we have to deal either with an accident or an abuse.

The frequent occurrence of this type of injury at an age dependent of the parental and socio-economic factors and also its psycho-social implications over the future adult, confersa wide study base.

Purpose

The purpose of the current study is to identify the most common types ofthermal injury, degree of the burn wound and percentage of the total body surface affected in the pediatric population between 0 and 3 years of age. The age range chosen is particularly important due to the role played by the parental supervision, or lack of it. The end goal is to identify the most exposed population and that of establishing some guidelines to prevent thermal injuries of the early childhood.

Materials and methods

The present study includes pediatric patients with ages ranged between 0 and 3 years, admitted in the Department of Pediatric Surgery over a 5 year period from 01.01.2004 until 30.05.2009. Some of these patients were discharged with complete wound epithelization, others were discharged and treated as outpatients until healing.

The total number of pediatric patients studied was 105, the distribution per year is as follows, as seen in table 1:

Table 1 – The distribution of cases per year.

Year	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*
Patients	21	20	15	20	13	13

[1]The Emergency Children's Hospital of Cluj -Napoca
[2]University of Medicine and Pharmacy "Iuliu Hatieganu" Cluj-Napoca
E-mail: doinaz@gmail.com, surgery_cluj@k.ro, horatiugocan@yahoo.com, simona_m19@yahoo.com

Criteria for hospitalization were those cited in the literature, namely [3,4,5,6]:

1. Second and third degree burns over 10% in patients under 10 or over 50 years
2. Second and third degree burns over 20% in patients of all age groups
3. Burns involving the face, hands, feet, genitalia, perineum, major joints
4. Third degree burns over 5 % in patients of all age groups
5. Electrical burns, including those caused by lightning
6. Chemical burns
7. Inhalation injury
8. Pre-existing medical conditions that may complicate treatment
9. Associated injuries, fractures
10. Burns in children admitted to hospitals without qualified personnel or equipment specific to pediatric care
11. Burn patients requiring a special social, emotional support, suspected child abuse, substance abuse

Results

The degree of theburn wounds was I, IIA, IIB, III, IV, in most cases the same patient showing varying degrees of burns, as depicted in table 2. The depth of the burn wound was considered according to the latest classifications [3,4,5,6].

Body surface area affected by thermal aggression ranged between 1 and 80%, (see table 3).

The burned area was calculated using the Lund-Bowder diagram [3,5].

Table 2 – Depth of burns spread over years depending on coexistence in the same patient.

Degree	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*Total*	*%*
I	1	-	-	-	-	-	**1**	0.95
IIA	6	5	5	9	3	2	**30**	28.58
IIB	4	2	2	1	1	2	**12**	11.45
III	-	-	-	1	-	-	**1**	0.95
I, IIA	3	4	2	3	3	2	**17**	16.19
IIA, IIB	5	8	6	3	1	6	**29**	27.63
I, IIB	2	-	-	1	1	-	**4**	3.80
I, IIA, IIB	-	-	-	1	-	-	**1**	0.95
IIA, IIB, IIIA	-	1	-	-	3	-	**4**	3.80
III, IV	-	-	-	-	1	-	**1**	0.95
IIB, III	-	-	-	1	1	-	**2**	1.90
I, II, III	-	-	-	-	2	-	**2**	1.90
Granulation	-	-	-	-	-	1	**1**	0.95
Total	21	20	15	20	13	13	**105**	100

Table 3 – Burned area.

Area burned%	*Total*	*Area burned%*	*Total*
1%	3	16%	1
2%	11	17%	2
3%	9	18%	1
4%	13	20%	4
5%	12	22%	1
6%	3	25%	4
7%	6	27%	1
8%	4	30%	4
9%	3	40%	3
10%	9	50%	1
14%	1	60%	1
15%	7	80%	1

The affected anatomical regions were the head, neck, limbs, chest, abdomen, buttocks, genitals, most burns affecting multiple body regions [7]. Overall we treated 268 distinct anatomical regions.

Dividing the anatomical regions arbitrarily we calculated separately the following entities:

1. Cephalic extremity(head and neck) - 36 pieces
2. Chest - 49 pieces
3. Upper limb (shoulder, arm, forearm) - 65 pieces
4. Hand - 25 pieces
5. Leg (buttock, thigh, calf) - 54 pieces
6. Foot - 20 pieces
7. Abdomen - 15 pieces
8. Perineum, groin - 4 pieces

Most of the anatomical regions affected were consistent with the mecanism of „pouring hot liquid".

Of the 268 regions anatomical treated in 52 cases there was a single area burned per patient, and in 53 cases multiple regions per patient. Regarding the harming agent affecting the studied population, the proportion was as follows: 86 with hot liquids, 3 with fat, 4 contact with hot solid objects, 8 flame, 2 chemical burns, 1 electrocuted, as shown in table 4.

Table 4 – The mechanism of thermal injury.

	Hot liquid	*Hot fat*	*Chemical burns*	*Solid hot*	*Flame*	*Electrocuted*	*Explosion*
2004	16	2	-	2	1	-	-
2005	18	-	-	-	2	-	-
2006	13	1	1	-	-	-	-
2007	14	-	1	1	-	-	-
2008	12	-	-	1	4	1	1
2009	13	-	-	-	1	-	-
Total	**86**	**3**	**2**	**4**	**8**	**1**	**1**
%	81.90	2.85	1.90	3.80	7.65	0.95	0.95

We found an overwhelming presence of burns caused by hot liquids consisting with scalding.

Regarding the social status and living conditions of the studied subjects, most of the pacients orginated from rural environnement, families with modest income and multiple siblings.

There was also a certain predominance of male pacients but not so increased as the one found in older children.

The distibution per gender and area of origin is detailed in tables 5 and 6.

Table 5 – The distribution of patients by sex .

	2004	*2005*	*2006*	*2007*	*2008*	*2009*	*Total*	*%*
Girls	9	9	6	8	11	7	**50**	47.62%
Boys	12	11	9	12	5	6	**55**	52.38%

Table 6 – Distribution of patients by area of origin.

	2,004	*2,005*	*In 2006*	*In 2007*	*In 2008*	*In 2009*	*Total*	*%*
Urban	9	11	7	12	5	6	**50**	**47.62%**
Rural	12	9	8	8	11	7	**55**	**52.38%**

Discussions

The results of this study are consistent with those of various other studies and literature [3,8,9,10].

Children are at particular risk from scalding because a given amount of hot liquid from a container will cover a much larger area compared with an adult (between a 6 years old child and an adult, the body surface area increases 6 times) [11,12].

Burns and fire is the fourth most common cause of accidental death in children [4].

Infants and young children suffer the most frequently scald burns or exposure to flame, burns and fire being the

fourth most common cause of accidental death in children [3,4,12].

Most children under 3 years hospitalized for burns, had the cause scalding or contact burns also demonstated by the affected body areas [4,5,7,12,13,14].

Burns produced by hot tap water and beverages cause more deaths and hospitalizations than other liquids.

The most recognized burn mechanism in infants and toddlers is the contact with hot liquids either by spilling or by immersion [14].

Almost 80 % of thermal injuries in children could be prevented although the main causes such as a poor socio-economic status, indifference of the parents and sometimes abuse are problems difficult to manage by the admitting physician [8,11,12].

References

1. JOHNSON C. F., *Inflicted injury versus incidental injury*, Pediatr. Clin. North Am., 37:791, 1990
2. ISAC F., ISAC A., BRATU T, *Arsurile,* Editura Dinamis Print SRL, Timisoara, 1994
3. MUGEA T.T., *Agresiuni Termoenergetice*, Oradea, Editura Universităţii din Oradea, 2002
4. ENESCU D., DAVIDESCU I., ENESCU M., *Pediatric burns in Bucharest, Romania; 4327 cases over a 5-years period*, Burns (1994), 20 (2): 154-156, 1994
5. HERNDON DAVID N., *Total Burn Care,* Saunders W B Co,2001
6. ASHCRAFT, K. W., HOLCOMB, G. W., MURPHY, J. P., *Pediatric Surgery,* 4th Edition, Elsevier Saunders, 2005
7. ALBU I., GEORGIA R., *Anatomie topografică*, Ed. ALL, Bucureşti, 1994
8. BENMER P. SAGI P., GREBER B., VARDY D., et. al., *An anlysis of mortality in patients with burns covering 40% BSA or more: a retrospective review covering 24 years* 1964-1988, 1991.
9. SHERIDAN R. L., REMENSNYDER J. P., SCHNITZER J. J., SCHULZ J., RYAN C. N., TOMPKINS R. G., *Current expectations for survival in pediatric burns*, Archives of Pediatric & Adolescent Medicine, vol. 154, nr. 3, 245-249, 2000
10. BULL, LAWRENCE, *Thermal conditions to produce skin burns. Fire and Materials, vol. 3*, nr. 2: 102-105, 1979
11. CARVAJAL H. F., *Survival statistics in burned children,* Journal of Burn Care and Reabilitation, 3, 81
12. ISAC F., ISAC A, BRATU P., BREZEAN C., *Arsuri Termice, Arsuri Electrice, Arsuri Chimice, în Tratat de Patologia Chirurgicală sub redacţia Nicolae Angelescu*, vol.1:653-717, Editura Medicală, Bucureşti, 2003.
13. ISAC F., ISAC A., BRATU T, *Arsurile,* Editura Dinamis Print SRL, Timisoara, 1994
14. KLEIN B. M., HEIMBACH M. D., GIBRAN N., *Tendinte actuale in tratamentul plagii arse*, ACS Surgery, 2004 Web MD Inc., University of Washington School of Medicine

Correspondance to:

Zamora Doina Elena,
Ion Andeescu Street, No.12C,
Zip Code 400306,
Cluj-Napoca City,
România
Telephone: 0745169902
E-mail: doinaz@gmail.com