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Burn Hemangioma: A New Variant of Hemangioma

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Keywords
Burn hemangioma · Pyogenic granuloma · Clinical and histopathological evaluation

Abstract
Background: Burn hemangioma, also known as scalded pyogenic granuloma, is considered a variant of pyogenic granuloma, but unlike the classic type it presents with rapid progression. Most patients are infants and young children with a history of burns caused by liquids. ***Objective:*** The present study aims to present all patients with burn hemangiomas treated at our institutions with a full clinical and histopathological assessment. ***Patients and Methods:*** This case series includes 34 cases that were treated during the period from 2016 to 2021. ***Results:*** A total of 34 patients (16 female/18 male, mean age of 17.6 years) were included. Two age groups presented: infants and children (n = 22, age range 0.5–8 years, 10 female/12 male), and adults (n = 11, age range 25–44 years, 6 female/6 male). Lesions appeared 1–2 weeks following predominantly second-degree burns, and multiple lesions predominated in infants and children. The lesions evolved to large lesions within weeks, and these appeared to be either static or involute. The histopathology was compatible with hemangioma, rather than pyogenic granuloma. ***Conclusion:*** Burn hemangioma should be considered a new variant of hemangioma rather than a type of pyogenic granuloma that follows second-degree burns. They have many similarities with infantile hemangioma, both clinically and histopathologically.

Introduction

Pyogenic granuloma (PG) is a well-recognized, commonly acquired vascular growth with a characteristic clinical and histopathological picture that usually arises as a single tumor that bleeds easily [1]. It frequently appears after trauma, but may arise spontaneously. In addition to the skin, mucous membranes may be affected [2]. It most commonly affects children, but may occur at any age [3].

There are reported cases, mostly in children, of multiple eruptive hemangiomatous lesions following contact with boiling liquids [4–25]. These lesions have been called scalded PG (SPG) and usually present as multiple eruptive nodules within days to weeks of scalding. The lesions

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Table 1. Demographic features of the included patients

	Group A	Group B
N	22	12
Age, years	0.5–8	25–44
Sex	12 female/10 male	6 female/6 male
Etiology, *n*		
Scalded burn (boiling liquids)	18	6
Fire flame	4	4
Electrical spark	0	1
Electrocautery	0	1

Fig. 1. A 35-year-old male with burn hemangioma on his upper extremities following a burn from a high-voltage electrical spark.

persist for weeks to months before they disappear spontaneously.

SPG have many clinical and histopathological similarities with infantile hemangioma in clinical imaging, course, and pathology [19].

Although burn-associated multiple PG or burn hemangioma was first described in 1978 with several similar reports, most of the published literature consist of single cases [4–14, 17, 18, 20–22]. Only two studies, Sharquie et al. [19] ($n = 6$) and Zhao et al. [15] ($n = 15$) have presented case series.

Patients and Methods

This case series describes patients from four general teaching hospitals in Baghdad, Basra, Najaf, and Nasiriyah during the period from January 2016 to January 2021. These patients presented with multiple vascular lesions following burns. The full history included sex, age, type and cause of burn, time interval between the burn and appearance of the lesions, and season of burn. Clinical examinations were performed, including evaluation of the morphology and number of the lesions, and assessment of the size, site, and the degree and extent of the burn. A biopsy was conducted from a single lesion from the patients and sent for routine histopathological examination.

Ethical approval was obtained from the ethical committee at the Iraqi medical specialization council as the responsible representative of the Ministry of Higher Education and Scientific Research. Informed consent was obtained from each patient or their caregivers for inclusion in this study and publication of their pictures.

Results

Thirty-four patients with lesions after burns were studied in hospitals in Nasiyriah ($n = 14$), Bagdad ($n = 12$), Basra ($n = 5$), and Najaf ($n = 3$), respectively. The female/male ratio was 15/19 with an age range from 6 months to 44 years, a mean of 17.6 years (SD 8.4) and a median of 3.5 years. They were segregated into two groups according to age (Table 1). All patients had second- and combined second- and third-degree burns from a variety of causes (Table 1). The lesions erupted 1–2 weeks after the trauma as small vascular nodules that enlarged rapidly over a course of days. Most cases were recorded in the winter as many people use gasoline petrol heaters in their houses and boil water or tea on these heaters.

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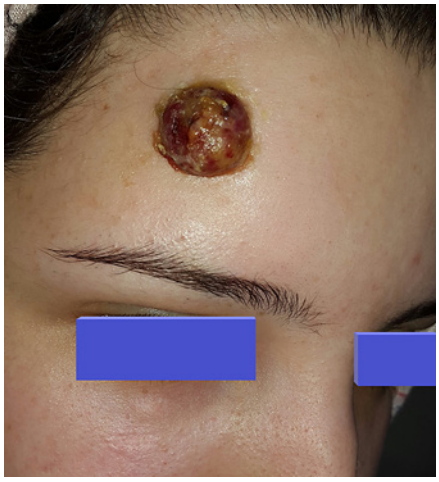

Fig. 2. Single PG developed on the forehead of a 26-year-old female following electrocautery of a mole.

3

Fig. 3. A fungating polypoidal burn hemangioma following a scalding burn from boiled water.

4

Fig. 4. Multiple burn hemangiomas arise on the scalp and the face of an 18-month-old child caused by a boiled milk burn.

In apearence, they were dark brown-grayish vascular-like nodules or polypoidal vascular giant lesions. The lesions were soft with a slightly bleeding surface (Fig. 1–4). They affected the superficial part of the second-degree burn in 31 cases (91.2%) and extended to the deep part of the burn in only 3 cases (8.8%). They were not noticed in areas of third-degree burns. The number of the lesions varied from 1 to 27 with a mean of 7.8 lesions. The infant and child group tended to have multiple lesions, while the adult group had few or single lesions (Fig. 1–4). The size of the lesions ranged from 1 × 0.5 cm to 12 × 12 cm. The sites of the lesions were the scalp in 2 patients, trunk in 6 patients, upper extremities in 8 patients, and lower extremities in 15 patients. Some patients had more than one site affected. The infant and child group had their lesions on the scalp, trunk, and extremities, while in the adult group the lesions were mostly on the extremities.

The histopathological examination showed epidermal hyperplasia and acanthosis, large dilated vascular spaces with new vascularization, and lobular capillary bud proliferation of variable sizes, lined by a single layer of flattened endothelial cells, mainly in the upper dermis (Fig. 5). In addition, severe stromal edema and mild to moderate inflammatory infiltrate consisting mainly of lymphocytes admixed with few plasma cells and eosinophils were observed.

Discussion

SPG or burn hemangioma is regarded as a rare complication [4–25]. We therefore gathered 34 patients over 5 years to provide more data on this rare tumor.

Most of the previous studies reported burn-associated multiple PG among infants and children [4–6, 8–12, 14, 15, 18, 20, 21, 25]. The present study suggests two populations, one younger and one older, affecting both sexes. The appearance of these lesions requires a specific combination of endogenous and exogenous factors to co-occur.

The etiology is therefore not clear but it has been suggested that specific exogenous proteins may play a role, because many previous studies were caused by scalding with boiling milk [5, 9]. The present study showed that the lesions can be caused by a range of thermal injuries, weakening the proposed association.

Simple secondary infection and the associated immune response were also suggested as a cause by other authors [5, 7–9, 11]. One of the proposed mechanisms was the imbalance of pro-angiogenic and anti-angiogenic factors [9, 26].

Clinical Presentation and Histology

The degree of burn is probably the most critical determinant. The present study has shown, like most previous

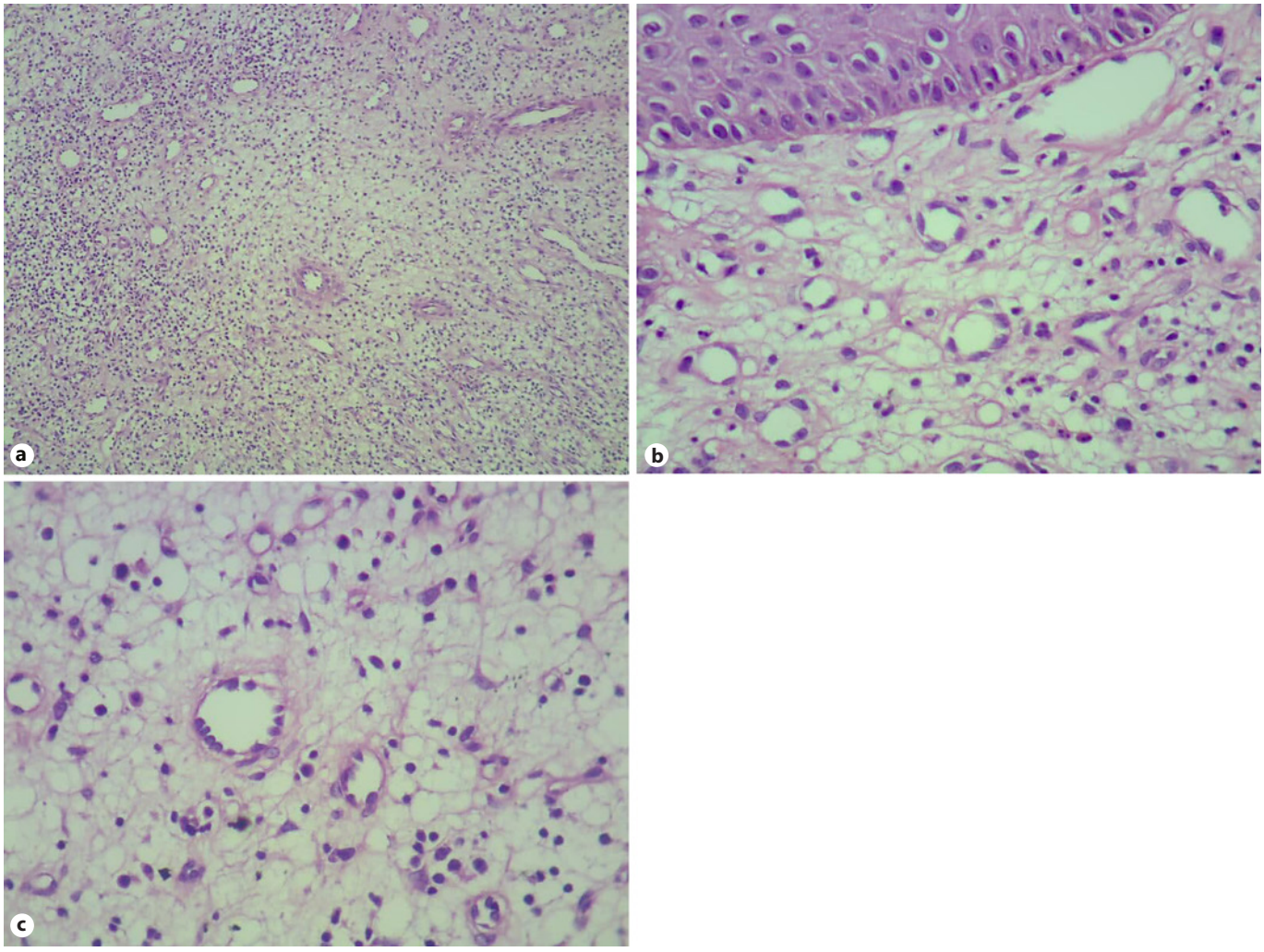

Fig. 5. a Histopathology of burn hemangioma, mainly new vascularization and dermal infiltrate. Original magnification, ×40. **b** Numerous blood vessels with dermal infiltrates consisting mainly of eosinophil and lymphocytes. Original magnification, ×400. **c** New vascularization with dermal infiltrate. Original magnification, ×400.

Table 2. Similarities between infantile hemangioma and burn hemangioma

	Infantile hemangioma	Burn hemangioma
Incidence	A common variant of hemangioma	Not infrequently seen in patients with burn
Age	Infants	Infants, children, and adults
Growth phases	Rapid, eruptive immediately after birth	Rapid, eruptive after second-degree burn
Course	The same growth phases but may take years	The same growth phases but may take weeks or months
Spontaneous resolution	Highly positive but within years	Highly positive but within weeks or months
Histopathology	Angiomatous pathology with positive CD markers but mainly CD133 and CD34	Angiomatous pathology with positive CD markers, specifically CD34

studies, that all enrolled patients were affected in areas of the second-degree burns, with sparing of the third-degree burn areas. We also interestingly noticed that most of the lesions developed at the more superficial part of the second-degree burn. This phenomenon is probably related to the greater possibility of development of granulation tissue as an essential element of wound healing of burns that are left for spontaneous healing.

It appears that lesions predominantly appear on newly enriched vascular areas of superficial dermis, and as the phases of growth of burn hemangioma resemble those of infantile hemangioma, we assume an identical or at least significantly overlapping pathophysiology.

The clinical picture and histopathological examination showed great similarity between burn and infantile hemangioma: rapid growth, statue stage, and spontaneous resolution occur in both diagnoses. Infantile hemangioma usually appears after birth and then rapidly grows within a few months, it then enters a statue state and is involuted within a few years.

Histopathologically, both demonstrated angiomatous pathology with a remarkable active proliferation of large endothelial cells. The previous studies observed difficult differentiation of the two conditions on routine histopathological staining and only minor differences were noticed on staining with PAS stain [27].

The membranous matrices were thicker with a more prominent lobular pattern in capillary hemangioma, but in PG blood vessels showed a clustered or medullar pattern separated by less vascular fibrotic septa and PAS-positive membranous matrices [27]. Immunohistochemical staining also shared positive specific markers like CD34 and the exact differentiation may necessitate immunohistochemical studies [27, 28]. The growth phases of both entities were similar with proliferative, statue, and spontaneous regression phases, in spite of the difference in time duration of these phases (Table 2). These great similarities make us to conclude that burn hemangioma should be considered as hemangioma rather than PG and deserve the name burn hemangioma, as was suggested previously by Professor Sharquie [19].

One limitation of our study is the lack of investigation of tissue culture/microbiome. The other limitation is the absence of the immunohistochemical staining of the biopsy specimen.

In conclusion, burn hemangioma is speculated to be a specific type of hemangioma with great clinical and histopathological resemblance to infantile hemangioma. This observation may influence future therapy development.

Key Message

"Burn hemangioma" is a condition associated with second-degree burns.

Statement of Ethics

Ethical approval was obtained from the ethical committee at the Iraqi medical specialization council as the responsible representative of the Ministry of Higher Education and Scientific Research (reference No. IRB-DVC 143). Written consent was obtained from each patient or their caregivers for inclusion in this study and the publication of their pictures.

Conflict of Interest Statement

ICMJE forms for Disclosure of Potential Conflicts of Interest were submitted by the authors, and none were declared.

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Author Contributions

All authors contributed actively to all stages of the study and manuscript preparation.

Data Availability Statement

All data generated or analysed during this study are included in this article. Further enquiries can be directed to the corresponding author.

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