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ORIGINAL ARTICLE

Epidemiology of Pediatric Dermatologic Surgery: A Retrospective Study of 996 Children

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KEYWORDS

Pediatric dermatology;
Epidemiology;
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Abstract

Objective: To describe the epidemiology of skin surgery performed in the dermatology department of Hospital Clínico Universitario in Valencia, Spain, on children up to 16 years of age. The study analyzed a 9-year period.

Materials and method: A retrospective review was performed of all tissue excisions and biopsies taken between January 1, 1990, and December 31, 2007, from patients up to 16 years of age seen in the dermatology department of Hospital Clínico Universitario. The following data were collected: age, sex, surgical site, and histopathologic diagnosis.

Results: Between 1990 and 2007, 33840 lesions were analyzed histologically; 996 of the lesions (2.94%) were from patients up to 16 years of age, of whom 502 (50.40%) were girls and 484 (49.60%) were boys. The mean age was 11.06 years. The majority (47.39%) of excisions were performed in children of 12 to 16 years. The distribution of the remainder by age groups was as follows: <1 year, 34 excisions (3.41%); >1 to <4 years, 66 (6.63%); >4 to <8 years, 154 (15.46%); and >8 to <12 years, 270 (27.11%). The most common diagnosis was melanocytic nevus (50.20%), followed by pilomatrixoma (4.62%), capillary angioma (3.61%), epidermal cyst (3.61%), Spitz nevus (3.31%), and pyogenic granuloma (3.11%).

Conclusion: Dermatologic surgery in patients up to 16 years of age accounted for a small percentage of the overall dermatologic surgery in our hospital; the majority of children were in the 12 to <16 year age group. Most children had benign lesions, with melanocytic nevus being by far the most common diagnosis. The majority of lesions were on the trunk, followed by the head and neck. In conclusion, compared with the literature reviewed, ours is the only series on dermatologic surgery in children. It is of interest because it defines the most common conditions in these patients.

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PALABRAS CLAVE

Dermatología
pediátrica;
Epidemiología;
Cirugía;
Niños

Epidemiología de la cirugía dermatológica pediátrica. Un estudio retrospectivo de 996 niños

Resumen

Objetivo: Realizar un análisis epidemiológico de la cirugía dermatológica realizada en pacientes menores de 16 años en el servicio de dermatología del Hospital Clínico Universitario durante un período de 9 años.

Método: Se revisaron retrospectivamente todas las extirpaciones y biopsias de pacientes menores de 16 años desde 1 enero de 1999 al 31 de diciembre de 2007 en el servicio de dermatología del Hospital Clínico Universitario de Valencia. Los datos recogidos incluían las siguientes variables: la edad del paciente, el sexo, la localización y el diagnóstico histopatológico.

Resultados: Dentro de este período, se analizaron histológicamente 33.840 lesiones. De ellas, 996 (2,94%) correspondieron a pacientes de ≤ 16 años. De las 996 piezas analizadas 502 (50,40%) correspondían a mujeres y 494 (49,60%) a varones.

La edad media fue 11,06. El mayor número de exéresis se situó entre los 12 y los 16 años (47,39%). La distribución del resto de extirpaciones por grupos de edad fue la siguiente: ≤ 1 año 34 extirpaciones (3,41%), de > 1 a ≤ 4 años: 66 (6,63%), de > 4 a ≤ 8 años: 154 (15,46%) y de > 8 a ≤ 12 años: 270 (27,11%). El diagnóstico más frecuente fue el de nevus melanocítico (50,20%), seguido del pilomatricoma (4,62%), el angioma capilar (3,61%), el quiste epidérmico (3,61%), el nevus de Spitz (3,31%) y el granuloma piogénico (3,11%).

Conclusión: En nuestra serie, la cirugía dermatológica en menores de 16 años constituye un pequeño porcentaje de la cirugía dermatológica que se realiza en nuestro hospital, siendo el grupo de mayor edad el más frecuente. En la edad pediátrica, la patología benigna representa el mayor número de diagnósticos, siendo con mucho los nevus melanocíticos la patología más frecuente. El mayor número de lesiones se ha encontrado en el tronco, seguido por la cabeza y el cuello. En conclusión, de la literatura revisada, nuestra serie es la única en lo referente a la cirugía dermatológica en la edad pediátrica, siendo de interés para conocer la patología que con mayor frecuencia se analiza en estos pacientes.

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Introduction

Skin surgery is a branch of dermatology that surgically treats skin, soft tissue, mucosa, and skin appendage disorders that cannot be resolved by medical treatment alone.

A number of features set skin surgery apart from other medical and surgical specialties. Most operations are performed on an outpatient basis, for example, using local anesthesia, and are therefore very well tolerated. Because these operations are generally minimally invasive, they ensure maximum preservation of surrounding healthy tissue and consequently result in considerably improved outcomes and shorter recovery times.

Skin disorders in children also differ from those seen in adults because of the histologic, physiologic, and immunologic characteristics of children's skin. Pediatric dermatology is therefore an emerging and growing specialty within the fields of pediatrics and general dermatology.¹ Skin disorders account for between 6% and 24% of all consultations in pediatric clinics, with an increasing incidence detected in recent years.^{2,3}

The literature contains many reports of the prevalence of pediatric skin disorders in dermatology clinics. In developed countries, the most common reason for consultation is

atopic dermatitis, followed by infectious diseases and melanocytic nevi.⁴⁻²¹ Although very interesting studies have been conducted on the epidemiology of general disorders encountered in pediatric dermatology practices, in our search of the literature, we found no specific analyses of the epidemiology of pediatric skin diseases requiring surgical treatment, hence our decision to perform such a study. Our aim was therefore to perform an epidemiologic analysis of skin lesions that were biopsied or excised in patients aged 16 years or younger at the dermatology department of Hospital Clínico Universitario in Valencia, Spain, over a period of 9 years (1999-2007).

Material and Methods**Setting**

The study was performed in Hospital Clínico Universitario in Valencia, Spain, whose dermatology department is a referral center for 16 health care centers and 1 regional hospital. On average, 36 500 visits (first and subsequent visits) a year are received and 3700 excisions and biopsies are performed. Approximately 11% of the patients seen are aged 16 years or younger. The patients are referred

to us through various channels such as other hospitals and departments (including dermatology departments), primary care centers, and our own hospital (hospitalized patients and the pediatric emergency department).

Inclusion Criteria

From the database of the pathology department of the hospital we extracted all histopathology reports corresponding to patients aged 16 years old or younger with skin tumors or inflammatory skin conditions who had undergone a diagnostic biopsy or excision in our department.

Data Collection

In order to compile epidemiologic statistics for the study population, we retrospectively reviewed the histopathology reports on all biopsies and excisions performed in patients aged 16 years or younger with skin lesions seen by our department between January 1, 1999 and December 31, 2007 (9 years). The following information was collected in each case: age and sex of patient, lesion site, and histopathologic diagnosis.

Statistical Analysis

The variables were analyzed using the STATA 9 software package. Differences between proportions were evaluated using the χ^2 test.

Results

In total, 112 816 patients were seen between January 1, 1999 and December 31, 2007, not including patients treated at the specialist outpatient clinic attached to the hospital; 12 833 (11.37%) were 16 years or younger (Figure 1). The mean number of patients treated annually was 1425 (range, 1130-1680).

In the 9 years covered by the study, 33 840 skin lesions were analyzed histologically (Table 1). Of these, 996 (2.94%) were from patients aged 16 years or younger. Children who underwent a surgical procedure accounted for 7.7% of all the patients treated in the department; the corresponding percentage for adults was 32.8% ($P<.001$). Table 1 shows the comparative figures for excisions performed in adults and children.

Of the 996 specimens analyzed, 502 (50.40%) were from girls aged 16 years or younger and 494 (49.60%) were from boys in the same age range (Figure 2).

The mean age of the patients was 11.06 years. Most excisions ($n=472$, 47.39%) were performed in patients aged 12 to 16 years. Only 34 excisions (3.41%) were performed in infants aged 1 year or younger. The corresponding figures for the other age groups were 66 excisions (6.63%) in children aged >1 to ≤ 4 years, 154 (15.46%) in children aged >4 to ≤ 8 years, and 270 (27.11%) in children aged >8 to ≤ 12 years.

The most common excision sites were the trunk (314 excisions, 31.52%), the lower limbs ($n=216$, 21.69%), the

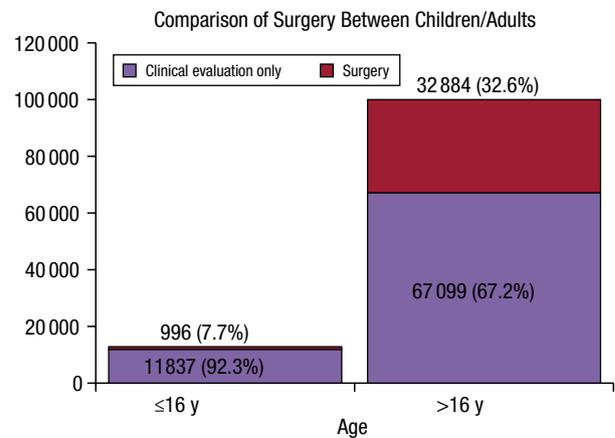


Figure 1 Patients seen in the dermatology department at Hospital Clínico Universitario, Valencia, Spain, between January 1, 1999 and December 31, 2007.

Table 1 Annual Excisions Performed in Adults and Children

Year	Adults		Children	
	Total	%	Total	%
1999	3037	95.35	148	4.65
2000	3581	99.40	18	0.60
2001	3794	99.71	11	0.29
2002	3627	97.60	90	2.40
2003	3465	95.66	157	4.34
2004	3584	95.42	172	4.58
2005	3794	96.12	153	3.88
2006	3866	96.84	126	3.16
2007	4096	97.13	121	2.87
1999-2007	32 844	97.06	996	2.94

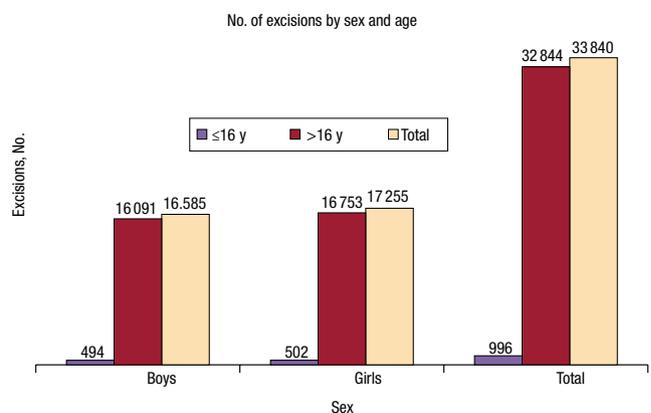


Figure 2 No. of excisions by sex and age.

head and scalp ($n=257$, 25.8%), the upper limbs ($n=163$, 16.37%), and the genitals ($n=18$, 1.81%) (Table 2).

The most common histologic diagnoses were melanocytic nevus (50.20%), pilomatricoma (4.62%), capillary angioma

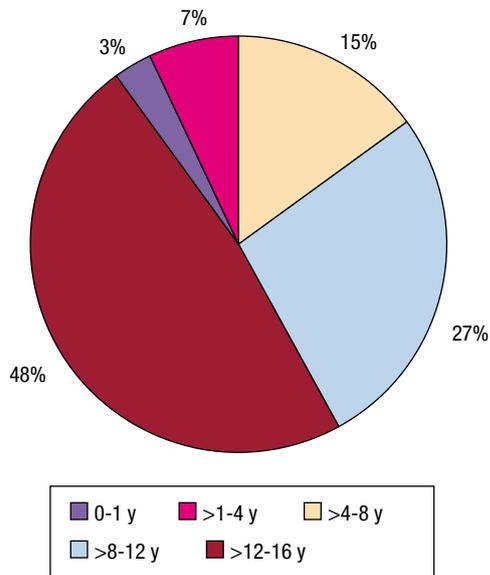


Figure 3 Percentage of excisions by age group.

Table 2 Excisions by Surgical Site

Site	No. of Excisions	%
Trunk	314	31.52
Lower limbs	216	21.69
Head and scalp	257	25.8
Upper limbs	163	16.37
Genitals	18	1.81
Not mentioned	28	2.81
Total	996	100

(3.61%), epidermal cyst (3.61%), Spitz nevus (3.31%), and pyogenic granuloma (3.11%) (Table 3). Histopathology showed that 9.3% and 3% of the lesions were due to inflammatory disorders and infectious conditions, respectively. The most common diagnosis in the infectious lesion group was viral warts, followed by molluscum contagiosum. The most common diagnoses by age group are shown in Table 4.

As already mentioned, melanocytic nevus was the most frequent diagnosis in our series. Among the lesions analyzed, the most common type was compound melanocytic nevus (n=267, 53.4%), followed by intradermal melanocytic nevus (n=122, 24.4%), junctional melanocytic nevus (n=54, 10.8%), Spitz nevus (n=33, 6.6%), blue nevus (n=12, 2.4%), and compound nevus (n=3, 0.6%). Histologic features of dysplasia were found in 44 lesions (8.8%); specifically, 30 compound melanocytic nevi, 10 junctional melanocytic nevi, and 4 halo nevi.

A high percentage of the lesions analyzed (79.92%, 796/996) were tumors. Of these, 786 (98.74%) were benign and 10 (1.26%) were malignant. The most common type of

Table 3 Tumor Types by Order of Frequency

	No. of Tumors	%
Melanocytic tumors	512	64.32
Melanocytic nevus	500	
Lentigo simplex	4	
Melanoma	4	
Melanocytic macules	3	
Becker nevus	1	
Vascular tumors	75	9.42
Capillary angioma	36	
Pyogenic granuloma	31	
Angiokeratoma	5	
Lymphangioma	1	
Tufted angioma	1	
Kaposiform hemangioendothelioma	1	
Adnexal tumors	48	6.03
Pilomatricoma	46	
Trichoblastoma	1	
Poroma	1	
Cysts	43	5.40
Epidermal cyst	36	
Mucocele	4	
Trichilemmal cyst	3	
Fibrous tissue tumors	43	5.40
Dermatofibroma	28	
Soft fibroma	10	
Angiofibroma	2	
Sclerotic fibroma of the skin	1	
Fibromatosis	1	
Dermatofibrosarcoma protuberans	1	
Epidermal tumors	42	5.28
Sebaceous nevus	20	
Epidermal nevus	16	
Seborrheic keratosis	4	
Basal cell carcinoma	1	
Squamous cell carcinoma	1	
Muscular and adipose tissue tumors	17	2.14
Smooth muscle hamartoma	9	
Lipoma	4	
Leiomyosarcoma	2	
Nevus lipomatosus cutaneous superficialis	2	
Neural neoplasms	6	0.75
Neurothekeoma	3	
Neurofibroma	2	
Nerve sheath myxoma	1	
Histiocytosis	5	0.63
Juvenile xanthogranuloma	5	
Mastocytosis	4	0.50
Lymphoma	1	0.13
Lymphomatoid papulosis	1	
Total	796	

tumors were of melanocytic origin (n=512, 64.32%) and within this group, melanocytic nevi were strongly predominant (97.65%). The second most common type were vascular

Table 4 Histologic Diagnosis by Age Group

Age	Most Common Diagnoses (No.)	Noteworthy Diagnoses (No.)	Total No. of Diagnoses (%)
>12-≤16 y	Compound MN (140) Intradermal MN (91) Dysplastic MN (30) Epidermal cyst (23) Junctional MN (20) Pyogenic granuloma (14)	SSM (2) DFS protuberans (1) BCC (1) Osteochondroma (1) Poroma (1) Syringocystadenoma papilliferum (1)	472 (47.39)
>8-≤12 y	Compound MN (58) Intradermal MN (23) Capillary angioma (17) Pilomatricoma (15) Pyogenic granuloma (10)	SSM (1) Nerve sheath myxoma (1) Neurothekeoma (1)	270 (27.11)
≤8 y	Compound MN (23) Pilomatricoma (16) Capillary angioma (8) Spitz nevus (7) Junctional MN (7)	Neurothekeoma (2) SCC (1) Lymphangiomas (1) Nodular Spitzoid melanoma (1) Porokeratotic nevus (1) Granular cell tumor (1)	154 (15.46)
>1-≤4 y	Pilomatricoma (10) Compound MN (10) Spitz nevus (8) Pyogenic granuloma (4)	Trichoblastoma (1)	66 (6.63)
≤1 y	Pyogenic granuloma (3) Leiomyosarcoma (2) Compound MN (2) Intradermal MN (2) Pilomatricoma (2) Epidermal cyst (2)	Cutaneous leiomyosarcoma (2) Aplasia cutis (1) Rudimentary digit (1) Plantar fibromatosis (1) Kaposiform hemangioendothelioma (1)	34 (3.41)

Abbreviations: BCC, basal cell carcinoma; DFS, dermatofibrosarcoma; MN, melanocytic melanoma; SCC, squamous cell cancer; SSM, superficial spreading melanoma.

neoplasms (10%). The predominant tumors in this group were capillary angiomas (4.52%) and pyogenic granulomas (3.89%, n=31). The third most common type was adnexal neoplasm (6.03%), among which pilomatricomas predominated.

Tumor lesions other than melanocytic nevi accounted for 37.2% (n=296) of the tumors analyzed; of these only 10 (1.26% of all tumor lesions) were malignant. Melanoma was the most common malignant primary skin tumor. Three of the 4 melanomas identified were superficial and the fourth was a nodular spitzoid melanoma. The other malignant tumors identified were 1 cutaneous leiomyosarcoma, 1 squamous cell carcinoma, 1 micronodular basal cell carcinoma, 1 dermatofibrosarcoma protuberans, and 1 cutaneous lymphoma.

Also noteworthy was the detection of several rare skin conditions, namely 3 neurothekeomas, 1 eccrine angiomatous hamartoma, 1 elastic nevus, 1 nevus lipomatosus cutaneous superficialis, 1 porokeratotic eccrine duct, 1 syringocystadenoma, 1 trichoblastoma, and 1 granular cell tumor.

Discussion

We found that 11.37% of all the patients treated in our dermatology department in the period studied were 16 years old or younger. This pediatric caseload is considerable and similar to figures reported by Goh et al⁶ and Casanova et al.²²

We also performed an epidemiologic study of skin lesion biopsies and excisions performed in pediatric patients in the 9 years covered by the study. Proportionally, very few children underwent surgery compared to adults. The difference is possibly due to the fact that, where possible, excisional surgery is often delayed until the patient is older and more likely to cooperate, as has been observed by Vergara et al.¹⁵ Another possible explanation is that the majority of lesions in pediatric patients are benign and can therefore be clinically monitored, without the need for excision. This might explain why we detected an increase in the proportion of patients undergoing surgery in older age ranges. Histology studies were performed in 10.04%

of patients aged 0 to ≤ 4 years, in 14.46% of those aged >4 to ≤ 8 years, in 27.1% of those aged 8 to ≤ 12 years, and in 47.4% of those aged 12 to 16 years ($P < .001$ for trend). A third of the adult patients treated by our department underwent surgery. This may seem surprisingly high but it should be noted that a large number of patients are referred to our department for the excision of tumor lesions or for confirmatory biopsy.

There was a slight preponderance of girls over boys in our series, a finding which is consistent with reports from other studies.^{8,19}

The trunk was the most common biopsy site. However, if we consider that the face accounts for just 4% of the total body surface, proportionally, more lesions were excised from the face than from any other location. This might be because more patients seek medical advice for facial lesions due to esthetic concerns.

It is difficult to compare our results with data from other studies as these have analyzed smaller series with different demographic characteristics. Nevertheless, melanocytic nevus was also the most common diagnosis detected by Vergara et al¹⁵ in a 2-year study of 179 pediatric patients who underwent surgery for skin lesions. Melanocytic nevus is now a common reason for consultation partly because of a greater awareness among the general population thanks to skin cancer prevention campaigns. We believe that the incidence of these lesions may decrease thanks to regular controls that can now be performed with digital dermoscopy; with the application of this technology, lesions will be removed only if absolutely necessary. Other common conditions observed in our series were pilomatricomas, infundibular cysts, sebaceous nevi, and vascular diseases. Although, as we have mentioned, it is difficult to compare our results with those of other studies, the most common diagnoses detected in our series do coincide with those reported by Vergara et al.

Malignant tumors accounted for only a very small percentage of the skin lesions excised from our patients. This was to be expected considering that most lesions treated in pediatric dermatology are benign.^{5,9,10}

We would like to stress that our findings are of particular interest in terms of identifying the most common skin disorders treated in pediatric patients as our series is the largest and longest published to date.

Conclusions

Skin surgery in patients aged 16 and younger accounts for only a small proportion of all surgery performed in our department. As was to be expected, most of the operations were performed in patients aged between 12 and 16 years. Consistent with findings from other series, there were slightly more girls than boys among our patients. The trunk, followed by the head and scalp, was the most common lesion site. Finally, the majority of lesions analyzed in pediatric patients were benign and the most common diagnosis by far was melanocytic nevus.

In conclusion, although numerous studies have provided very interesting findings on the epidemiology of general disorders encountered in pediatric dermatology

departments, our series is the largest published to date on skin surgery in pediatric patients.

Conflict of Interest

The authors declare that they have no conflict of interest.

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