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# Knuckle Pads in Children

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● **Knuckle pads occur from benign thickening of the skin, principally the epidermis, and are occasionally seen in children. Despite the name, knuckle pads most commonly overlie the proximal interphalangeal joints. They must be differentiated from a variety of other cutaneous abnormalities. There is no consistently effective treatment, but knuckle pads have been reported to resolve spontaneously in children.**  
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Knuckle pads are well-defined, rounded thickenings of the skin overlying the dorsal surface of any digital joint, but especially over the proximal interphalangeal joints. The lesions are usually asymptomatic and grow slowly over months to years, sometimes reaching 2 cm in diameter. Isolated knuckle pads must be recognized as benign but persistent growths that should be differentiated from other digital lesions.

## PATIENT REPORTS

**PATIENT 1.**—A 4-year-old boy presented with growing lesions overlying his knuckles for one year. He denied discomfort, pruritus, and trauma to the fingers and had no other medical problems. Physical examination disclosed firm, hypopigmented pads, varying from 0.2 to 1 cm in diameter, over the proximal interphalangeal joints of the index, third, and fourth fingers of the left hand and the index through fifth fingers of the right hand. He had no involvement of the thumbs or toes and no palmoplantar keratoderma. He was treated with salicylic acid (Keralyt) gel under polyvinyl wrap occlusion for three months without any response.

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**PATIENT 2.**—A 12-year-old boy with palmoplantar keratoderma had first noted the pads on his fingers "years ago" and had recently noted no change. The lesions were asymptomatic. He denied trauma to the lesional sites. His mother also had palmoplantar keratoderma but no lesions overlying her fingers. The pads were found over the proximal interphalangeal joints of the third through fifth fingers on the left hand and the index through fifth fingers on the right hand; varied in size from 0.6 to 1.2 cm in diameter; and were firm, hypopigmented, and slightly mobile (Fig 1). In addition, the boy had marked thickening of the palms and soles and hyperkeratotic plaques on his elbows and knees. He desired no therapy.

**PATIENT 3.**—A 14-year-old girl first developed lesions at 9 years of age. The lesions grew during a period of months and have subsequently remained unchanged, except for slight enlargement following cryotherapy to all lesions at 13 years of age. The pads are asymptomatic, and the patient reports no trauma. The palms and soles are hyperkeratotic. On examination, the patient has smooth hypopigmented pads overlying all proximal interphalangeal joints, including the thumbs (Fig 2). The second through fourth toes also have pads over the proximal interphalangeal joints.

The mother has palmoplantar keratoderma but no knuckle pads. A 17-year-old brother has a nine-year history of knuckle pads over the proximal interphalangeal joints of all fingers and the thumbs but not the toes. The mother reports that the brother bites only the joints of the second and third digits of the right hand. The father has no cutaneous lesions. The patient has noted softening and flattening of the lesions with 25% urea lotion during one month of treatment.

**PATIENT 4.**—A 9½-year-old girl had an 18-month history of increased skin thickness with hyperpigmentation over the joints of both hands and feet. The hand lesions were not tender or pruritic, but the foot lesions were slightly pruritic. She denied trauma to the sites and had no other medical problems. On examination, well-circumscribed hyperpigmented plaques

were present over the metacarpophalangeal joints of the fourth and fifth digits of the left hand and over the proximal interphalangeal and metacarpophalangeal joints of the second through fifth digits of the right hand. The thumbs were unaffected. Similar plaques were noted overlying the proximal interphalangeal joints of all the toes, except for the halluces.

A skin biopsy specimen was obtained from a lesion on the left hand. Histopathologic examination of skin sections showed marked hypertrophy of the stratum corneum with an increased number of granular cell layers and thickening of the epidermis (Fig 3). There was no inflammation. The patient applied 0.025% fluocinolone acetonide (Synemol) cream twice daily to the lesions without any observable change over two months.

## COMMENT

Knuckle pads were originally described in 1893 by Garrod<sup>1</sup> but have been evident from the Renaissance in paintings and on human sculpture, most notably Michelangelo's statue of David in Florence, Italy.<sup>2,3</sup> Knuckle pads most frequently occur in teenagers and young adults but may also develop in younger children. Although the lesions are usually asymptomatic, their appearance may cause concern. The pads appear as slowly growing thickenings over the dorsal aspects of the digital joints. The extent of involvement may range from a single finger to all digits, including the thumbs.<sup>4</sup> Although the pads may be noted over the knuckles (metacarpophalangeal joints), they are more frequently found overlying the proximal interphalangeal joints. Occasionally, they may be present overlying the distal interphalangeal joints. Rarely, knuckle pads are present on the toes. Usually, multiple knuckle pads do not appear simultaneously but develop sequentially. They often begin on one side of the joint and spread to the dorsal surface. The knuckle pads may

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Fig 1.—Well-circumscribed, smooth, hypopigmented plaques overlying proximal interphalangeal joints of patient 2. Patient also had palmoplantar keratoderma.



Fig 2.—Hypopigmented pads overlying proximal interphalangeal joint of thumbs of patient 3. Patient also had palmoplantar keratoderma.

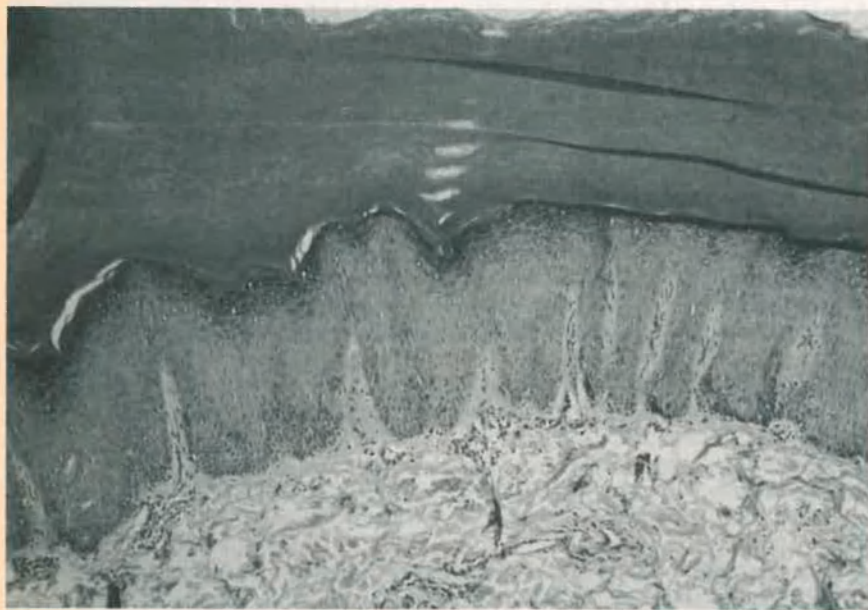


Fig 3.—Skin section from lesional skin of patient 4 with generalized thickening of epidermis, hypertrophy of stratum corneum, and increased number of granular cell layers (hematoxylin-eosin,  $\times 100$ ).

be hypopigmented or hyperpigmented, particularly in dark-skinned individuals. They are freely movable over underlying joints. In children, they may vary in size from 0.5 to 2 cm in diameter and are usually painless. Knuckle pads take months to years to attain their final size.

Histopathologically, biopsies of skin from knuckle pads may show two different patterns, one with preponderantly epidermal changes and the other with primarily dermal changes. The

first type is more common in children and shows thickening of the keratin layer and the lower epidermis, as well as slight proliferation of fibroblasts and capillaries of the upper dermis without infiltration by inflammatory cells.<sup>2</sup> The second type demonstrates marked fibroblast proliferation with thickened and irregular collagen bundles and increased collagen in the dermis as well as epidermal hyperkeratosis.<sup>5</sup> Electron microscopic examination of lesions of this second type demon-

strates the presence of dermal myofibroblasts.<sup>8</sup>

In children, the occurrence of knuckle pads is usually sporadic and idiopathic. Occasionally, a parent or child reports rubbing, biting, or picking the fingers,<sup>7</sup> but this history is unusual. Several patients with familial idiopathic knuckle pads have been described, with an autosomal-dominant mode of inheritance.<sup>8,9</sup> In contrast to the idiopathic nature of most knuckle pads in children, trauma to the skin overlying joints in adults is a common cause of knuckle pads but usually is related to occupational exposure.

Knuckle pads have also been observed in association with a number of other disorders. Autosomal-dominant palmoplantar keratoderma with or without ichthyosis vulgaris has been previously described in association with knuckle pads,<sup>4</sup> as was the case in patients 2 and 3. In patients with keratodermas, hyperkeratotic plaques not uncommonly occur on the elbows and knees, sites of frictional trauma. The mechanism for the development of knuckle pads in these children may be similar. Knuckle pads have also been noted on the fingers of apes and may be related to trauma to these sites from walking with pressure on bent digits.<sup>10</sup> Palmoplantar keratoderma and knuckle pads have also been reported in conjunction with sensorineural and conductive hearing loss and total leukonychia.<sup>11,12</sup> This syndrome appears

Disorder	
Knuckle pads	Sm
Scars, keloids	Sm
EPP	Wa
EBA	Mill
EBD	Mill
Callus	Ro
GA	Sut
Rheumatoid nodules	Sut
Gottron's papules	Fla

\*EPP indicates erythema multiforme; Wa, Waikiki; Mill, Millersville; Ro, Rochester; Sut, Sutton; Fla, Florida.

to be inherited in dominant mode, and patients with knuckle pads do not uncommonly, patients with palmoplantar keratoderma have knuckle pads. Patients with knuckle pads do not exhibit contractures. In adults, knuckle pads have been found in patients with contractures, but these associations have not been noted in children.

Because knuckle pads are thought to be processes, their

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Differential Diagnosis of Knuckle Pads\*

Disorder	Clinical Features	Histopathologic Features	Course
Knuckle pads	Smooth fibrous thickenings, loss of skin lines, may be hypopigmented or hyperpigmented	Usually hyperkeratotic with thick epidermis; increased collagen	Often persistent
Scars, keloids	Smooth to nodular, elevated fibrous plaques at site of previous lesion	Parallel or whorled bundles of collagen; fewer capillaries and fibroblasts	Persistent
EPP	Waxy scars	Hyalin deposition	Persistent
EBA	Milia, atrophy	Atrophy, scar	Persistent
EBD	Milia, atrophy	Atrophy, scar	Persistent
Callus	Rough, fibrous, retained skin lines	Hyperkeratotic with thick epidermis	Clears if treated
GA	Subcutaneous nodule; annular plaque with papules at periphery, central clearing	Collagen degeneration surrounded by histiocytes and lymphocytes	Clears after months
Rheumatoid nodules	Subcutaneous nodules	Same as GA	Often persistent
Gottron's papules	Flat-topped violaceous papules	Variable, like dermatomyositis	Follow course

\*EPP indicates erythropoietic protoporphyria; EBA, epidermolysis bullosa acquisita; EBD, epidermolysis bullosa dystrophica; and GA, granuloma annulare.

to be inherited in an autosomal-dominant mode, and patients all develop the knuckle pads during childhood. Not uncommonly, patients with this syndrome have knuckle pads that become clawlike on the toes, probably because of the greater trauma to the feet. Many patients do not complain of hearing loss but exhibit loss on audiometric testing. In adults, knuckle pads have been found in patients with Dupuytren's contractures and in one patient with pseudoxanthoma elasticum, although these associations have not yet been noted in children.<sup>9,14</sup>

Because knuckle pads are benign processes, their importance lies in dif-

ferentiating them from more significant cutaneous disorders (Table). In children, a number of benign cutaneous alterations that may overlie joints must be considered. These include scars, calluses, and granuloma annulare. Scars overlying the joints of the dorsa of hands may result from trauma or from inflammatory disorders, such as erythropoietic protoporphyria, epidermolysis bullosa acquisita, and the dystrophic forms of hereditary epidermolysis bullosa. In children with collagen vascular diseases, rheumatoid nodules associated with juvenile rheumatoid arthritis or systemic lupus erythematosus may be confused with

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knuckle pads. These nodules are seen in 6% to 10% of patients with polyarticular juvenile rheumatoid arthritis<sup>15</sup> and in 5% to 7% of patients with systemic lupus erythematosus.<sup>16</sup> Gottron's papules are pathognomonic for dermatomyositis and are typically localized to the dorsal surface of the joints of the hand.

Several patients with knuckle pads have reported their eventual disappearance. However, the lesions may persist indefinitely. Treatment for knuckle pads is usually unnecessary, since the lesions tend to be asymptomatic, and is often unsuccessful. For cosmetic reasons or for the occasional patient with itching or discomfort, therapeutic trials may be undertaken. If an underlying cause is determined, then it must be eliminated. Patients with knuckle pads in association with palmoplantar keratodermas or who exhibit predominantly epidermal pathologic features may benefit from the use of topical keratolytic agents, such as lactic acid, salicylic acid, or urea. The use of protective coverings, such as moleskin bandages, to the pads may be helpful for children with hyperkeratotic lesions due to trauma. Children with knuckle pads that are more fibrous histologically deserve a trial of topical corticosteroids with occlusion. Intralesional corticosteroids have been used with some success, but this therapy is painful and inappropriate for younger children. Excision of the nodules should not be performed, since severe scarring and possible keloid formation may result, and the lesions often recur after simple excision.