

Journal of Hand Surgery (British and European Volume)

<http://jhs.sagepub.com/>

Epidemiological and Structural Findings Supporting the Fibromatous Origin of Dorsal Knuckle Pads

A. CAROLI, S. ZANASI, A. MARCUZZI, D. GUERRA, G. CRISTIANI and I. PASQUALI RONCHETTI

J Hand Surg [Br] 1991 16: 258

DOI: 10.1016/0266-7681(91)90049-T

The online version of this article can be found at:

<http://jhs.sagepub.com/content/16/3/258>

Published by:



<http://www.sagepublications.com>

On behalf of:

[British Society for Surgery of the Hand](#)



[Federation of the European Societies for Surgery of the Hand](#)



Additional services and information for *Journal of Hand Surgery (British and European Volume)* can be found at:

Email Alerts: <http://jhs.sagepub.com/cgi/alerts>

Subscriptions: <http://jhs.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

Citations: <http://jhs.sagepub.com/content/16/3/258.refs.html>

>> [Version of Record](#) - Jun 1, 1991

[What is This?](#)

EPIDEMIOLOGICAL AND STRUCTURAL FINDINGS SUPPORTING THE FIBROMATOUS ORIGIN OF DORSAL KNUCKLE PADS

A. CAROLI, S. ZANASI, A. MARCUZZI, D. GUERRA, G. CRISTIANI and I. PASQUALI RONCHETTI

From the Hand Surgery Unit, and Institute of General Pathology, University of Modena, Italy

Epidemiological, optical and electron microscopical findings suggest that dorsal knuckle pads and Dupuytren's disease are fibrosing disorders with common features. In all cases examined, knuckle pads were always associated with Dupuytren's contracture and, in a significant number of cases, with bilateral Dupuytren's contracture. In a statistically significant number of patients with knuckle pads, Ledderhose's and Peyronie's diseases were also present ($P < 0.001$). Optical and electron microscopical studies showed that cell types and extracellular matrix were identical in knuckle pads and Dupuytren's nodules in different patients.

Journal of Hand Surgery (British Volume, 1991) 16B: 258-262

Paget, in 1875, described anomalous bursae on the dorsal surface of the P.I.P. joint. Since then, these lesions have been variously called "subcutaneous fibroma" (Hauck, 1924), "tylositas articuli" (Carol, 1940), "phalangeal pads" (Touraine, 1942), "coussinets des phalanges" (Sezary and Bolgert, 1942), "nodositá articulari" (Pezzuoli, 1960) and "nodositá dorsali" (Mangini, 1965). However, the English term "knuckle pads" is the most commonly used.

Since Garrod, in 1893, several researchers have pointed out the association between dorsal knuckle pads and Dupuytren's disease, as lenticular nodules in the subcutaneous tissue on the dorsum of the P.I.P. joints are quite often seen in Dupuytren's patients.

Knuckle pads are painless, subcutaneous thickenings over the dorsal aspect of the P.I.P. joint or, exceptionally, of the M.P. joint (Hueston, 1984). They are adherent to the skin and scarcely mobile over the extensor tendon. They are round or ovoid, with a smooth surface and a hard elastic consistency. The overlying skin is normal or hyper-pigmented. The evolution of knuckle pads is progressive and gradual; sometimes they spontaneously become smaller without disappearing.

They do not cause any damage to the P.I.P. joint or any limitation of its movement. When knuckle pads reach their maximum development, they become tender when knocked, but the cosmetic appearance and difficulty in removing a ring are the main problems. Hueston (1982) reported a case in which both active and passive flexion of the D.I.P. joint were limited, but excision restored complete motion. Recurrence after surgical treatment is common, so operation is advised only when symptoms are severe and the appearance unacceptable. Rheumatoid arthritis, gout, Bouchard's osteoarthritic nodules, capsular swelling and occupational keratosis may present similar features and must therefore be considered when knuckle pads are not associated with Dupuytren's disease.

Epidemiological data show that both Dupuytren's and knuckle pads are most frequent in Scandinavia, where

the strongest association between the two disorders has also been found. In Sweden, Skoog (1948) reported that 44% of patients with Dupuytren's had knuckle pads. Much lower values (about 11%) were observed in the U.S.A. by Boyes (1954). Interestingly, Hueston (1963), in Australia, reported that the association was 20% in fresh cases and 75% in cases recurring after operation.

Both knuckle pads and Dupuytren's disease, as well as their association, are more frequent in men than in women (Early, 1962; Mikkelsen, 1977).

The pathogenesis of knuckle pads is unknown, but several theories have been proposed. A hereditary basis has been suggested by White (1907), Weber (1938) and Coste (1942), while Skoog (1976) proposed that knuckle pads are due to an anomalous reparative process following recurrent injuries in predisposed subjects, such as in Dupuytren's disease.

Clinical material

Among patients observed from 1985 to 1988, knuckle pads were always associated with other fibromatous disorders. During the period from 1985 to 1988, 352 patients affected by Dupuytren's disease were treated in the Hand Surgery Unit of the University of Modena. 318 (90.3%) were men and 34 (9.7%) women. Their ages ranged from 28 to 84 years, with a mean of 58. Knuckle pads were observed in 54 (15.3%) of these patients: 51 men (94.5%), three women (5.5%), aged from 28 to 66 years (mean 46). The index finger (57%) and right hand (61%) were most frequently affected. 81% of patients with knuckle pads had bilateral Dupuytren's disease, but only 48% of patients without knuckle pads had bilateral Dupuytren's. Furthermore, in 31% of patients with both Dupuytren's and knuckle pads we observed Ledderhose's plantar nodules too, which are present in only 6% of patients with Dupuytren's but without knuckle pads. Similarly, 8% of patients with knuckle pads were affected by La Peyronie's disease, compared to only 2% of patients with Dupuytren's but no knuckle pads.

We have never seen knuckle pads between the P.I.P. and D.I.P. joint, as reported by Hueston (1982).

Two cases were particularly interesting. The first was a 40-year-old man, who had had bilateral Dupuytren's disease for 18 years and presented a painless knuckle pad on the dorsum of the I.P. joint of the thumb (Fig. 1). The second was a 42-year-old woman with bilateral Dupuytren's and Ledderhose's disease for seven and five years respectively, who had skin depressions on the dorsal aspect of all fingers P.I.P. joints in both hands (Fig. 2). The skin over these depressions was greatly adherent and hyperpigmented; P.I.P. joint movement was normal.

Twelve (22%) of the 54 patients with knuckle pads were treated by surgical excision: 10 (83%) men and two (17%) women. Generally, men required surgery because of tenderness when the P.I.P. joint was knocked during normal manual activities, whereas women requested excision for cosmetic reasons.

Under tourniquet, with the help of loupes, the knuckle pad was exposed through a dorsal transverse or longitudinal incision over the dorsum of the P.I.P. joint. The skin was dissected up from the nodule, which was carefully separated from the extensor apparatus to which it was adherent. Then primary skin suture was performed. The P.I.P. joint was mobilised 48 hours later.

Nine of the 12 patients were followed-up; the mean follow up was 31 months. Seven cases (78%) had good results; one had moderate stiffness, because he had not carried out the recommended rehabilitation programme and another, who underwent excision of nodules from all fingers of the right hand, had a recurrence in the index finger after six months.

Light and electron microscopic findings

Knuckle pads and Dupuytren nodules were cut into small fragments, which were labelled, kept separated and

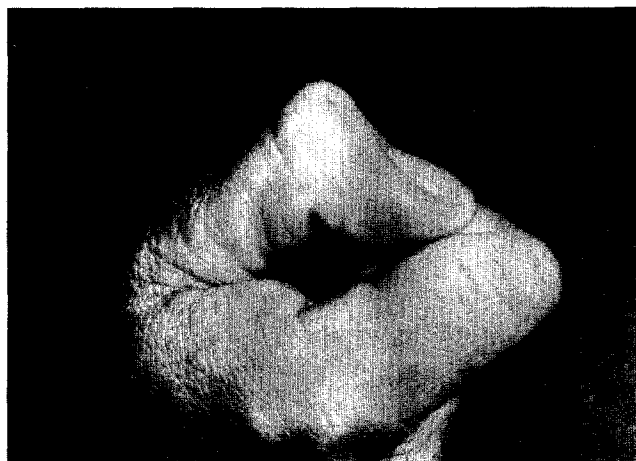


Fig. 1 This 40-year-old patient has had bilateral Dupuytren's disease for 18 years. There is a knuckle pad on the dorsal aspect of the i.p. joint of the right thumb.

immediately fixed in 2.5% glutaraldehyde (Fluka) in Tyrode's solution at pH 7.2 in the presence of 0.1% toluidine blue O (Sigma), for 24 hours at 4°C. After washing in Tyrode's solution and postfixation in 1% osmium tetroxide in Tyrode's plus 0.05% toluidine blue O, the samples were dehydrated in graded alcohol and embedded in epoxy-resin. Semi-thin sections (about 2 µ thick) were stained with toluidine blue and studied under the light microscope. Ultra-thin sections (60 nm thick) were stained with uranyl acetate and lead citrate and examined through a Philips 400 T electron microscope.

Both knuckle pads and Dupuytren's nodules consisted of discrete areas of cell aggregates and prominent fibrosis.



Fig. 2 42-year-old woman suffering bilateral Dupuytren's for seven years and bilateral Ledderhose's for five years. She had skin depressions on the dorsal aspect of all fingers over the p.i.p. joints, of which one is shown here.

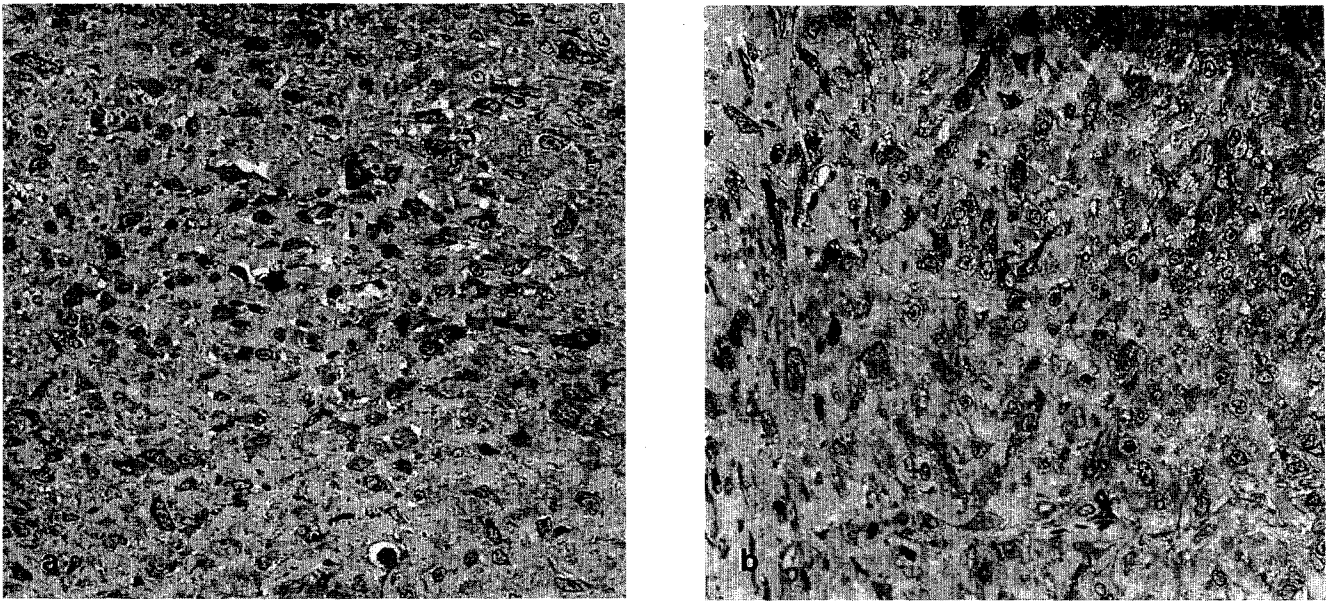


Fig. 3 (a) Cell aggregates in Dupuytren's nodule. (b) Similar aggregation in a dorsal knuckle pad. In both cases, the cells are heterogenous in shape and size, do not exhibit peculiar orientation and are separated by loose extracellular matrix ($\times 320$).

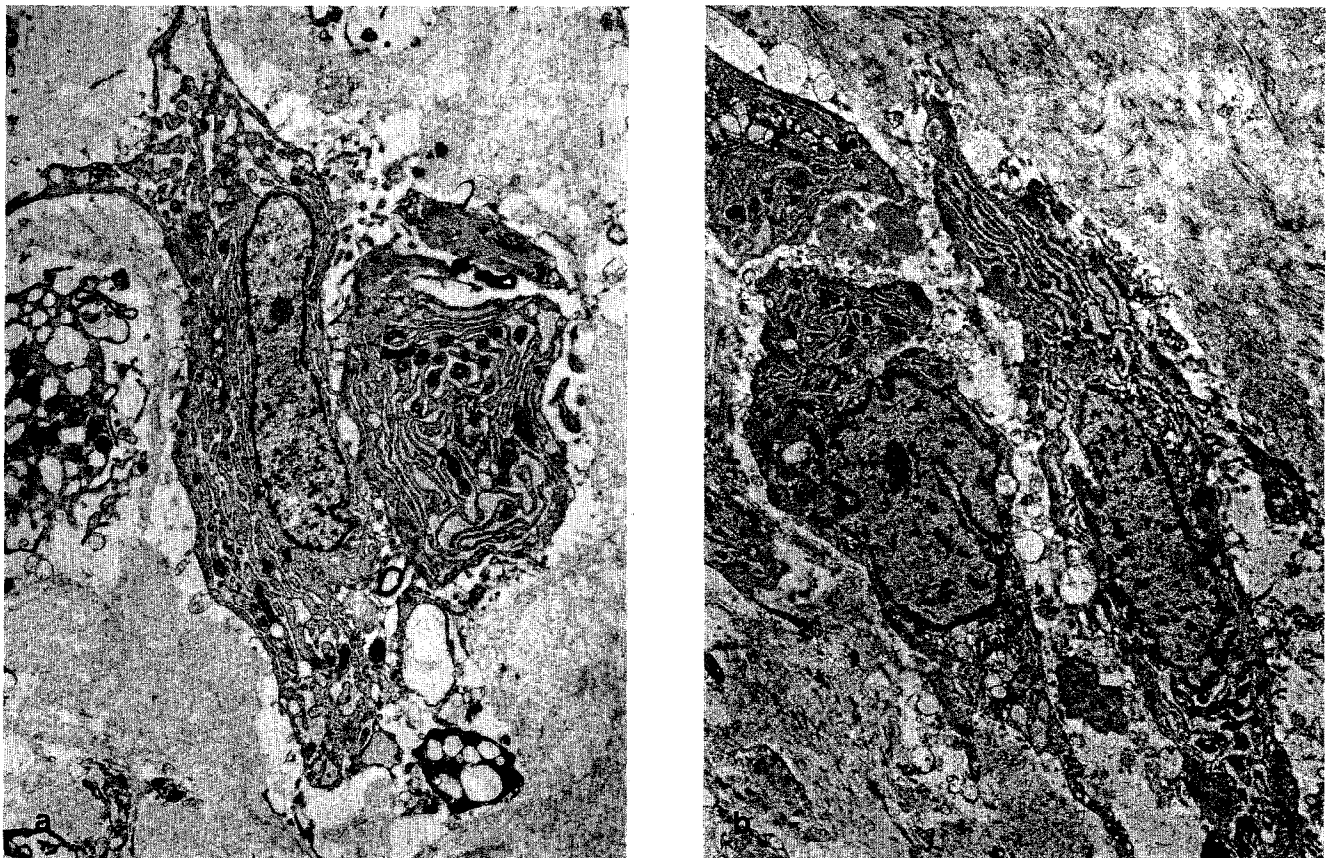


Fig. 4 (a) Electron micrograph of cells in a Dupuytren's nodule ($\times 6000$). (b) A dorsal knuckle pad. Fibroblast-like cells are surrounded by a poorly organised matrix, in which collagen fibrils can be recognised. Some cells show signs of degeneration, whereas others appear to be very active synthesizing cells. Contacts between cells are very loose ($\times 6000$).

In both, the aggregates were made of polymorphous cells, separated by a poorly organized extracellular matrix (Fig. 3). Fibrotic areas consisted of wavy collagen fibres and a few fibroblast-like cells. The distribution, size and shape of the cells in the two pathological conditions were almost identical. In both, the cells were polymorphous and had no specific orientation or contacts with their neighbours. The nuclei were large, with a smooth or wrinkled contour and chromatin was variously distributed. The cytoplasm was expanded and often swollen.

Figure 4 shows the ultra-structural appearance of cells and extra-cellular matrix in Dupuytren's nodules and knuckle pads. At this high magnification, the similarities between the two pathological conditions are again clear. In both, cells could be recognized as fibroblasts or myofibroblasts. In some areas, macrophages could be seen in both situations. All cells had several long cytoplasmic digitations, through which they were in contact with cells nearby. Most cells had well-developed rough endoplasmic reticulum, Golgi complexes, and numerous mitochondria; others had cytoplasmic vacuoles and signs of degeneration. Cell fragments were always present in the extracellular matrix, which consisted of a variable number of collagen fibrils, 33–47 nm. thick, immersed into a network of filaments, containing proteoglycans, demonstrated by staining with toluidine blue O (Baccarani Contri et al., 1985).

In a parallel study, nodules, fibrotic cords and clinically normal aponeuroses from a number of Dupuytren's patients were carefully studied by optical and electron microscopy. Although similarities were always seen between the knuckle pads and the Dupuytren's nodules, structures similar to Dupuytren's fibrotic cords were never seen in knuckle pads.

Discussion

Our epidemiological and morphological data support the hypothesis that knuckle pads and Dupuytren's disease are phenotypic expressions of a similar fibromatous disorder of the connective tissue. Their occurrence together was statistically significant (95% confidence interval) and 81% of patients with both pads and Dupuytren's had Dupuytren's in both hands. Moreover, Ledderhose's and La Peyronie's diseases were significantly more frequent in patients suffering both Dupuytren's and knuckle pads than in those with isolated Dupuytren's disease ($P < 0.001$), suggesting that these four fibrosing diseases are probably related.

From the structural point of view, Dupuytren's nodules and knuckle pads appear to be similar pathological events occurring in different areas with the same histogenetic origin. The cell types, their distribution and phenotypic expression, as well as the production of extracellular materials, strongly suggest that in both cases unknown stimuli, working on a genetically favourable



Fig. 5 Myofibroblast-like cells, characterised by the bundles of microfilaments with dark regions in the sub-plasmalemma, are often seen in the dorsal knuckle pads ($\times 15000$).

substrate, lead to cell proliferation and collagen deposition. Fibroblast-like cells, myofibroblast-like cells and macrophages represent the great majority of the cell population in both affections. In both conditions, the cells form clusters or are dispersed into loosely-packed collagen fibres. The main difference between the two pathological conditions is the greater amount of collagen in Dupuytren's tissue than in knuckle pads; in addition, collagen bundles packed tightly as in Dupuytren's fibrotic cords were never seen in knuckle pads.

Knuckle pads do not "contract", even in the presence of well-developed myofibroblasts (Fig. 5). This also indicates that "contracture" is not the result of "cellular" events, as suggested by some authors (Gabbiani, 1972; Badalamente, 1983), but might depend on external factors such as the anatomical site and functional activity of that particular area.

References

- BACCARANI CONTRI, M., FORNIERI, C., PASQUALI RONCHETTI, I. (1985). Elastin-proteoglycan association revealed by cytochemical methods. *Connective Tissue Research*, 13: 237–249.

- BADALAMENTE, M. A., STERN, L. and HURST, L. C. (1983). The pathogenesis of Dupuytren's contracture: Contractile mechanisms of the myofibroblasts. *Journal of Hand Surgery*, 8: 3: 235-243.
- BOYES, J. H. (1954). Dupuytren's Contracture. Notes on the age at onset and the relationship to handedness. *American Journal of Surgery*, 88: 147-154.
- CAROL, W. L. L., PRAKKE, J. R. and Van ZWIJNDREGT, H. A. (1940). Tylositas articulari (Knuckle pads; Fingerknöchelpolster). *Acta Dermatovenereologica*, 21: 1: 87-97.
- CORNELI, F. and ANDREINI, G. (1958). Contributo clinico alla eziopatogenesi del morbo di Dupuytren. *Rivista di Ortopedia e Traumatologia dell'apparato motore*, 26: 651-674.
- COSTE, F., MARCERON, L., TISSIER, M. (1942). Deux cas de coussinets des phalanges. Hérité similaire. Rapports avec la maladie de Dupuytren et d'autres fibrosités. *Annales de Dermatologie et Syphiligraphie*, 2: 482-483.
- EARLY, P. F. (1962). Population studies in Dupuytren's contracture. *Journal of Bone and Joint Surgery*, 44B: 3: 602-613.
- GABBIANI, G. and MAJNO, G. (1972). Dupuytren's Contracture: Fibroblast Contraction? An Ultrastructural Study. *American Journal of Pathology*, 66: 1: 131-146.
- GARROD, A. E. (1904). Concerning pads upon the finger joints and their clinical relationships. *British Medical Journal*, 2: 8.
- HAUCK, G. (1924). Über subkutane Fibrome an der Dorsalseite der Fingermitelgelenke. *Medizinische Klinik Wochenschrift für Praktische Ärzte*, 20: 2: 1569.
- HUESTON, J. T. *Dupuytren's Contracture*. Edinburgh, E. & S. Livingstone, 1963.
- HUESTON, J. T. (1982). Dorsal Dupuytren's disease. *Journal of Hand Surgery*, 7A: 4: 384-387.
- HUESTON, J. T. (1984). Some Observations on Knuckle Pads. *Journal of Hand Surgery*, 9B: 1: 75-78.
- MANGINI, U. (1965). Atipia di manifestazioni cliniche e di decorso della malattia di Dupuytren. *Rivista di Chirurgia della Mano*, 3: 289-296.
- MIKKELSEN, O. A. (1977). Knuckle pads in Dupuytren's disease. *The Hand*, 9: 3: 301-305.
- PAGET, SIR J. (1875). On the minor signs of gout in the hands and feet. *British Medical Journal*, 1: 665-666.
- PEZZUOLI, G., RADICI, G. and GUGLIENETTI, R. *La malattia di Dupuytren*. Torino, Edizione Minerva Medica, 1960.
- SEZARY, A. and BOLGERT, M. (1942). Kératomes des doigts (coussinets des phalanges) et sclérodémie. *Bulletin de la Société Française de Dermatologie et de Syphiligraphie*, 2: 482.
- SKOOG, T. (1948). Dupuytren's contraction with special reference to aetiology and improved surgical treatment. Its occurrence in Epileptics. Note on knuckle pads. *Acta Chirurgica Scandinava*, 96: Supplement 139: 1-190.
- SKOOG, T. *Chirurgia Plastica*. Padova, Piccin Ed., 1976. 445-446.
- TOURAINÉ, A. (1942). Coussinets des phalanges. *Bulletin de la Société Française de Dermatologie et de Syphiligraphie*, 2: 481-482.
- WEBER, F. P. (1938). A note on Dupuytren's contraction, camptodactylia and knuckle pads. *British Journal of Dermatology and Syphilis*, 50: 26-31.
- WHITE, W. H. (1907). On pads on the finger joints. *Quarterly Journal of Medicine*, 1: 479.

Accepted: 9 January 1990
 Prof. I. Pasquali Ronchetti, Inst. of General Pathology, via Campi, 287, 41100-Modena, Italy.

© 1991 The British Society for Surgery of the Hand