

## SUBCHONDRAL BONE CYSTS OF THE HAND

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Bone cysts localized beneath the articular cartilage give rise to disputes about their etiopathogenesis. This explains also the various denominations of the condition suggested, such as synovial ganglion of bone, lacunar defect of bone, cystoid lesion of the carpal bones, abnormal synovial cysts, unusual ganglion cysts etc.

As a rule, literature reports on the problem deal with a limited number of patients. Thus, Black (2) describes two patients with subchondral bone cysts localized in the wrist, Landells (9) — similarly two patients with localisation in affected in advance bones, Hicks (11) — four cases with synovial cysts in the bones, Crable (3) — ten cases with localization beneath the tibial plateau, ulna, femoral neck and external malleolus, Crane et al (4) — two patients, Molten et al (10) — two patients with scapular localization, and Dashesky (5) — one patient with involvement of the talus. After analysis of the reports referred to above, one is impressed by the fact that in some of the cases it is by no means a matter of subchondral bone cysts, but rather of essential bone cysts, or cysts of other nature.

This is a report on a series of nine patients (4 men and 5 women) with subchondral bone cysts localized in the hand, with an attempt to outline the viewpoints about the character and treatment policy in this condition. In four patients of the series the cysts were located in the carpal bones, and in five — in the interphalangeal (IP) joints.

Thus far, several different hypotheses concerning the nature of subchondral bone cysts have been postulated.

The first hypothesis assumes that it is a matter of a ganglion developing within the bone. Crane et al (4) endeavour to prove that the macro- and microscopic structure of subchondral bone cysts is similar to that of the ganglion. Doyle (6) explains the appearance of a ganglion as the result of a synovial membrane or tendon vagina tear. Bennett (1) draws a parallel between the appearance of meniscal cysts and subchondral bone cysts. It is well known that the ganglion grows from the articular capsule, tendon sheath and periosteum, and therefore, it is rather difficult to explain the occurrence of a ganglion beneath the cartilaginous part of a joint. Similar ganglionic formations may cause bone wear from pressure in the attachment site to the capsule, often identified in villonodular synovitis. However, it should be pointed out that the wear is by no means subchondral since it opens towards the joint.

According to the second hypothesis, Fere\* (1932) admits that in this case inheritable factors are involved. However, no such inheritable factors were discovered in the present study.

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\* Cited by Black.

In the third hypothesis, Jaffe (7) accepts that it is a matter of aberration of synovial cells beneath the cartilage, leading to development of subchondral bone cysts. In any case, such explanations should lead to the occurrence of cysts during the growth period, as it is the case with solitary bone cysts, enchondromas and the like. On the contrary, subchondral bone cysts usually appear in the more advanced decades of life, when it is already too late for the aberrated synovial cells to develop.

The fourth hypothesis explains the appearance of subchondral bone cysts as the sequel of osteoarthritis or rheumatism — Plewes\*\* (1940) Landells (9), Woods (11). It is believed that osteolytic foci filled with fibrous tissue consequent to mucoid degeneration occur. Harrison, Schajowicz and Trueta\*\* (1953), studying cysts in osteoarthritis, reached the conclusion that they are produced by bone necrosis foci, or inflammation, and occur in pressure zones. Landells (9) points out that the cysts communicate with the joint, and also that the joint fluid pressure is an important etiological factor. However, in patients with subchondral bone cysts osteoarthritic changes are not invariably detected, and there are no signs of degenerative changes in the other joints.

The fifth hypothesis is based on the traumatic origin of subchondral bone cysts, and is supported by most of the authors: Sheild\* (1877), Doyle (6), Rhambly and Lamb\*\* (1955), Lloyd—Roberts\*\* (1955), Bennett (1), Ferguson\*\* (1964), Golding\*\* (1966), Dashevsky (5). It is assumed that single or repeated trauma, or else, constant pressure result in microfractures or trabecular fractures in the subchondral region, which in turn leads to the formation of subchondral cysts. There are dissenting opinions regarding the mechanism of bone cyst development after trauma. Some authors are in the opinion that focal bone necrosis in these zones takes place by way of osteoclasia. Others admit that articular cartilage fissures are produced wherein joint fluid penetrates and forms cysts as the result of pressure.

Our study of nine patients with subchondral bone cyst of the hand corroborates the traumatic hypothesis. In the past history of the patients there is evidence of repeated injury mostly of the third finger, which is the longest (5 patients), and on the second place — the carpal bones situated beneath the radius (4 patients). The patients' occupation was associated with constant injury and strain of the hand. Hence, we presume that subchondral bone cysts are the result of repeated microtrauma or repeated stress, leading to obstruction of small terminal blood vessels in the area of the subchondral space. Thus, small necrotic processes develop beneath the cartilage while the latter continues to be supplied by the synovial fluid. Subsequently, the small necrotic zones undergo fibrous and mucinous degeneration and cystic formation. Later on, fissures of the articular cartilage and intercommunication between the cystic formations and articular spaces may take place.

Clinicalwise, subchondral bone cysts may run a practically asymptomatic course for an indefinite period of time. Whenever the subchondral bone cysts are located in areas of weight-bearing or compression, the patients complain of dull and vague pains. In seven cases of the series under review, pain in a determined region of the hand was the cause for consulting medical advice.

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\* Cited by Black.

\*\* Cited by Crane et al.

Anamnestically, the affection is related to a past hand injury without fracture. In more advanced stages, swelling of the involved joint is noted, accompanied by restriction and painfulness of movements. Five patients reported that they have undergone treatment for rheumatism. The results of laboratory study in our series failed to disclose variations from the normal values.

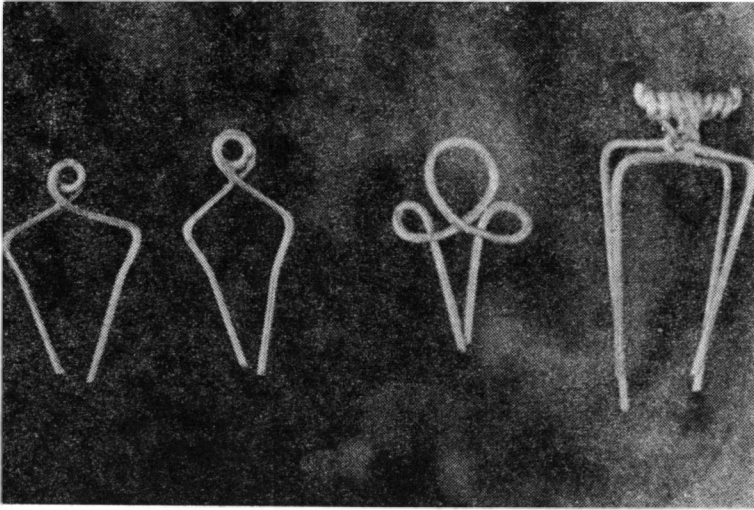


Fig. 1. Types of compression staples made of Kirse'tacr wire.

The X-ray study shows lytic cystic formations with the usual subchondra localization. As a rule, the cysts have smooth, sclerotic walls, and the cartilaginous surface is without visible degenerative changes. In carpal bones involvement, the proximal-row bones are more frequently affected, the scaphoid in particular. In case of IP joints affection, the proximal phalanx is the most frequently involved, but later, cysts may be detected in either of the bones making the joint.

Pathoanatomically, during the operation, thin-layered bone cysts situated immediately beneath the cartilaginous surface of the joint are discovered. Usually, they measure the size of a pea grain and, depending on the stage of development, they may be filled with a synovia-like, fibrous-mucinous or pseudopapillous content, invariably the result of an osteolytic process. One or more cysts may be present which, in some instances, communicate with the articular space, with an intercystic communication also being by no means ruled out. The form of the cyst is oval.

The biopsy study in our patients showed fibrous, mucoid, gelatinous or osteoid appearance of the cystic content. Occasionally, it may display signs of a non-specific inflammatory process, or pseudopapillous outgrowths. The cyst wall has the character of a pseudocyst. Crane and Scarano state that a similarity with a ganglion is not ruled out since in part of the cyst it is possible to detect synovia-like lining with presence of basophilic mucin within or around the fibrous wall. Doyle and Bennett emphasize that it is a matter of a false capsule, and by no means a ganglion.

It is recommended to make differential diagnosis with 1) chondroma of the hand skeleton, 2) solitary bone cyst, 3) aneurysmal bone cyst, 4) eosinophilic granuloma, 5) fibrous dysplasia and 6) synovial sarcoma.

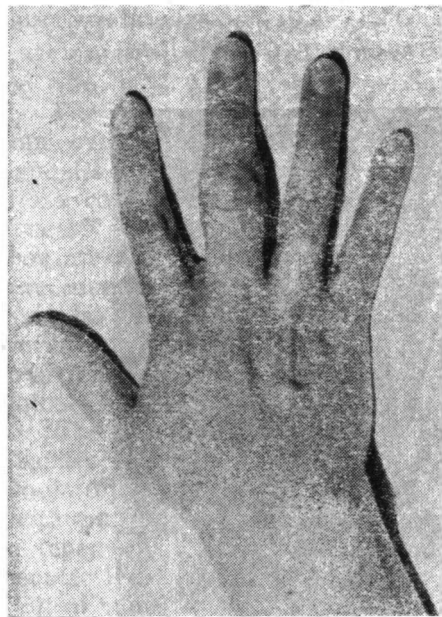


Fig. 2. Swelling of the proximal IP joint of the long finger caused by subchondral bone cyst.

The evolution in untreated subchondral bone cysts may result in an increase of their number, as well as in pathological fractures with signs of nonunion, aseptic necrosis of cartilage, and later, to arthrotic changes in the affected joint. The function of the joint is progressively restricted. In case of communication with the articular space, the pressure exerted by the joint fluid interferes with proper healing of the cyst.

As a rule, the treatment of subchondral bone cysts is operative. Compression arthrodesis of the small joints is secured through personally designed compression staples (Fig. 1). The operation consists in opening of the joint, cartilage cleansing, meticulous enucleation of the cysts, followed by bone filling of the resulting cavities with cancellous bone, most frequently homografts. In multiple cysts of the small digital joints situated bipolarly relative to the joint it is preferable to fuse the latter in phy

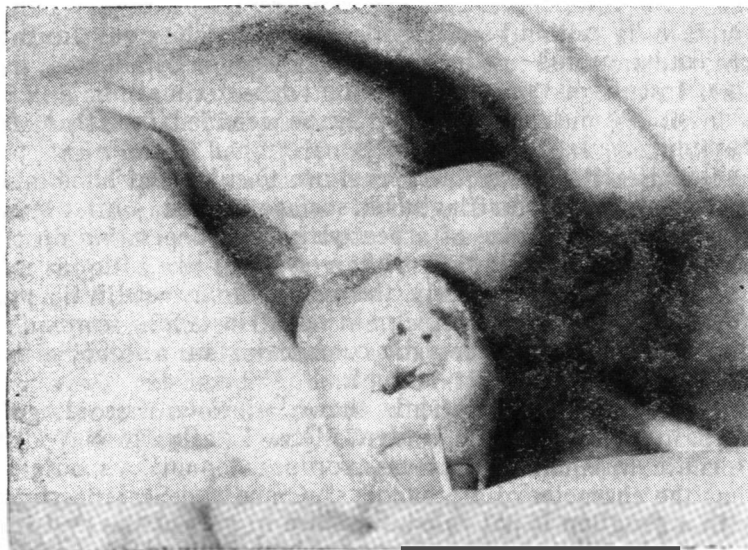


Fig. 3. The long finger after surgical excision of the cysts and compression arthrodesis.

biological position of the finger, with fixation being secured by means of a thin Kirschner wire. Then, compression arthrodesis is performed through

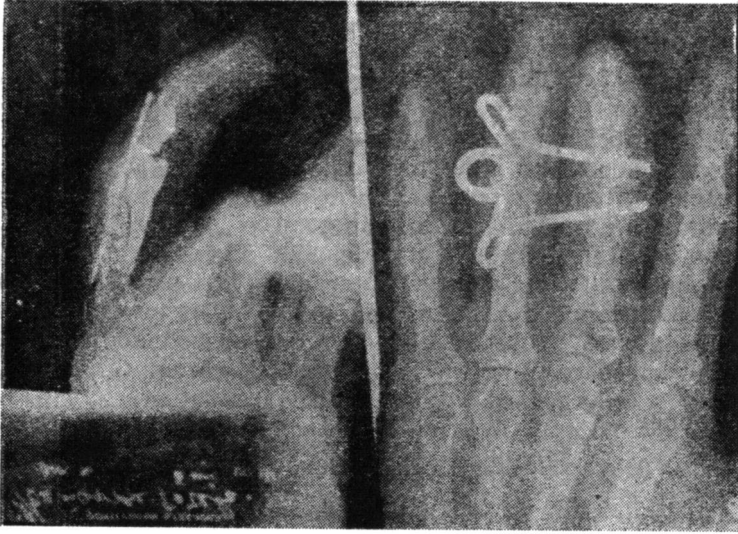


Fig. 4. X-ray of the fused joint through stapling and compression.

taping which contributes to the quicker bone healing, and discards plaster-cast immobilization (Figs. 2, 3, 4). The compressive device and the Kirschner wire are removed within 30 days of insertion. In this manner four patients with subchondral bone cysts of the IP joints of the hand were operated on with a good postoperative result.

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**СУБХОНДРАЛЬНЫЕ КОСТНЫЕ КИСТЫ РУКИ***К. Карчинов***Р Е З Ю М Е**

Этиопатогенез субхондральных костных кист не полностью выяснен. Интерпретируются существующие гипотезы в отношении этиологии этих кист: ганглион, аберрация синовиальных клеток, остеоартрит и ревматизм, наследственная передача и травматическое происхождение.

Сообщается о девяти больных с субхондральными костными кистами руки, принимая травматическую гипотезу о происхождении этих кист. Касается четырех мужчин и пяти женщин в возрасте 17—60 лет, среди которых у четырех кисты локализуются в карпальных костях, а у пяти — в межфалангиальных суставах пальцев руки. У четырех больных проведена эксскохлеация кисты, заполнение кости спонгиозной костной тканью, компрессионный артродез в физиологическом положении пальцев. Артродез осуществляется собственной компрессионной скобой.

## CONSIDERATIONS ON THE ISSUE OF COMBINED INJURIES

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Combined trauma is still a major problem with which traumatologists, surgeons and neurosurgeons are confronted. In time of peace, this particular trauma is very serious, and parallel to the development of mechanization processes and transport means, its incidence is steadily increasing (Petru-menko — 3, Ravenko — 11, Rozhinskii — 12, Yazjikov — 17).

Patients with combined injuries are being referred from one to another specialist since their medical attendance is a difficult and very responsible task (Kabanov — 8, Ravenko — 11, Rozhinskii — 12, Sokov — 13, Poberezhnii — 10).

In the last few years, the combined injury has been considered as one of the chief causes for illness and incapacitation, reaching up to 10 per cent of the total morbidity rate of the population (18.20 per cent).

Over the period 1969 through 1973, a total of 552 patients with multiple injuries underwent treatment at the surgical department of the Medical Faculty — Varna. Most of them — 345 (62.50 per cent) — were the victims of traffic accidents. The highest number of patients were admitted during the summer season, when Varna and its region are being visited by large numbers of holiday makers and tourists. The incidence of occupational injuries, and of home injuries as well is much lower, 122 (22.1 per cent) and 85 (15.3 per cent) respectively. Our data are very close to those reported by Babalich (1), Baturin (2), Bogdanov (3), Boychev (4,5), Ravenko (11), Feygin (14), Shalimov (16).

Distribution according to occupations shows that the most numerous group is represented by patients engaged in industrial enterprises, followed by agricultural workers, clerks, building workers, pupils, pensioners and housewives.

The male sex is the most frequently affected — 382 (65 per cent). Female patients amount to 170 (34 per cent). The patients living in urban areas amount to 331 (59.96 per cent), and in rural areas — 221 (40.04 per cent).

Patients aged 20 to 60 years prevail, that is, the age of highest working ability efficiency. The percentage of combined injuries among children is considerable — 15.43 per cent — being mainly of street-traffic nature.

A favourable condition contributing to the efficiency of treatment of this category of patients is their timely transportation to the hospital unit. Analysis of the case material shows that 65.60 per cent of the patients have been transferred to the hospital within two hours of injury, 28.37 per cent — within 2 to 6 hours, and a very small number (6.04 per cent) — within 6 to 12 hours. In 136 patients (24.65 per cent), the primary trauma involved the femoral region — mainly femoral fracture. When combined with concomitant