

# High-Resolution Ultrasonography of Wrist Ganglia

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**Abstract:** High-resolution ultrasonography was performed on 14 patients with soft tissue swelling of the wrist and hand. The examination was done using a real-time 10-MHz sector probe placed directly on the lesion. The sonographic image could always demonstrate the liquid nature of cystic lesions. In recent ganglia, the fluid content was anechoic, and the cystic walls were rather thin; in some older lesions, irregular internal echoes and thicker walls were found. Rather often, multiple ganglia were observed, grouped in clusters. The presence of a liquid-filled duct directed to the articular space was demonstrated in 8/11 cases (73%). This finding is considered a diagnostic characteristic of ganglia, and it is very useful for correct surgical planning. In extensor cystic tenosynovitis, the echographic picture was quite different: the anechoic cavity was longitudinal in shape, following the tendon sheath, and the communicating duct was absent. Finally, the sonographic pattern of one case of de Quervain's disease was analyzed and discussed. **Indexing Words:** Ultrasonography · Ganglia · Soft tissues

Ganglia are thin-walled cysts that develop in relation to a joint capsule; their most frequent site of development is the dorsal aspect of the wrist.<sup>1-3</sup> In spite of the technical improvements made in diagnostic imaging in recent years, the diagnosis of ganglia is still based mainly on clinical grounds. Plain-film radiography of the hand may prove useful only to detect ganglia causing erosion of the underlying bone. Xeroradiography, which significantly improves the imaging of soft tissues,<sup>5,6</sup> is helpful to depict the outer wall of the ganglion and its relationships with the superficial planes. However, it is useless in evaluating the deeper face of the node owing to the superimposition of osseous structures. Arthrography of the wrist joint can demonstrate ganglia through a communication between the ganglion and the joint cavity, which exists in most cases.<sup>7-9</sup> In contrast, direct contrast injection into the ganglion usually fails

to demonstrate such a communication, probably because of the presence of a valve mechanism.<sup>7,9</sup> Contrast arthrographic studies, however, are invasive procedures that cannot be recommended as a first-line diagnostic approach in all cases of wrist ganglia.

Ultrasonography has proven to be effective for imaging superficial soft tissues, particularly if high-resolution probes are used.<sup>10,11</sup> The use of ultrasonic imaging has already been recommended for the study of the lower extremities,<sup>12,13</sup> and it has proven very useful in the diagnostic work-up of popliteal cysts.<sup>14,15</sup> At the hand level, echographic examination has been reported for the study of glomus tumors<sup>16</sup> and the flexor tendons.<sup>17</sup>

The need for a simple, quick, and noninvasive imaging procedure for the diagnostic work-up of ganglia comes from the possibility of confusing this condition with other causes of wrist swelling, namely, cystic tenosynovitis and de Quervain's disease. These latter are inflammatory diseases and have a different course and require a specific treatment. For these reasons, we have evaluated the technical feasibility and effectiveness of high-resolution ultrasonography for the diagnosis of ganglia.

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## MATERIALS AND METHODS

High-resolution ultrasonography was performed in 14 patients with localized soft tissue swellings of the wrist or hand that were clinically suspected to be ganglia in 13/14 cases. The case material also included three patients with extensor tenosynovitis, who were examined for comparison. Our case population was equally distributed between males and females (seven and seven) with a mean age of 33.5 years. In particular, half of the cases were under 30 years; the remaining belonged to the age group from 30 to 40 years (4/14 cases) and to the group between 40 and 50 years (3/14).

In 13/14 patients (93%), the swelling was unilateral; in 12/14 cases, it was localized to the dorsal aspect of the wrist.

Ultrasonography was carried out using a real-time sector scanner (Elscont) with a new 10-MHz small parts probe. The probe was placed directly on the skin over the lesion. In some cases, the images obtained in this way were compared to those produced with a 5-MHz linear array small parts transducer or with a compound 7.5-MHz probe placed directly over the skin or used in combination with a Kitecho path.

The ultrasonographic pattern of the lesions could be comparatively evaluated, in some cases, with surgical findings at operation.

## RESULTS

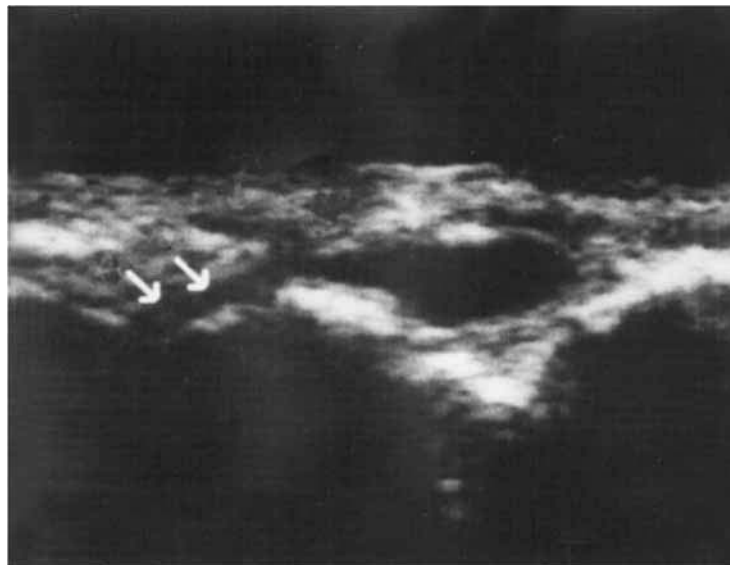
The ultrasonographic diagnosis of ganglia as fluid-filled anechoic structures was possible in all cases,

and there was a good agreement between the echographic pattern and the surgical findings. However, only the high-resolution 10-MHz probe was able to image the fine details of the ganglion and its surroundings. The use of high-resolution ultrasonography allowed us to establish some diagnostic criteria for ganglia and associated lesions.

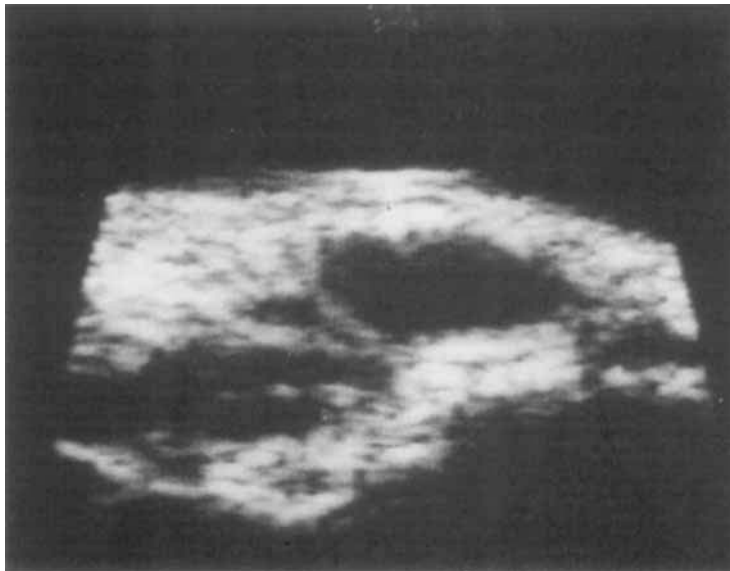
Generally, ganglia appeared as round anechoic lesions with well-defined regular walls (Fig. 1), sometimes grouped in clusters (Fig. 2). Recurrent ganglia may present with irregular walls and internal echoes as a result of some degree of organization of the cystic fluid (Fig. 3).

A peculiar finding, which appeared to be a diagnostic characteristic of ganglia, is the presence of a small anechoic duct originating from the inner wall of the ganglion and directed to the deeper planes (Fig. 1). This duct represents the communication between the ganglion and the articular space; its demonstration is very important for surgical planning since failure to identify and obliterate this synovial pedicle contributes greatly to recurrences<sup>3,7</sup>. The communicating duct was demonstrated in 8/11 cases (70%) of wrist ganglia. Failure to demonstrate a duct arose mainly from fibrosis of the surrounding structures and cyst walls, a common finding in older ganglia.

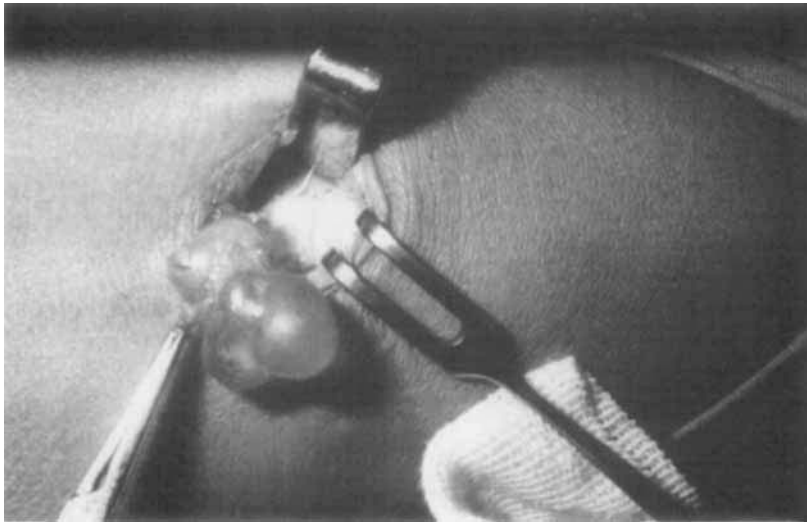
Extensor tenosynovitis possessed a very different echographic pattern. In the cystic type (two cases), the anechoic lesion had a longitudinal extension, corresponding to the tendon sheath, showing irregular margins without joint pedicles (Fig. 4). In one patient with de Quervain's tendon



**FIGURE 1.** Ganglion of the dorsal aspect of the wrist, overlying the radiocarpal joint. The sonographic pattern of the lesion is quite typical and consists of an oval-shaped cavity with regular walls and without internal echoes. A thin duct (arrows), representing communication with the articular space, is also seen.

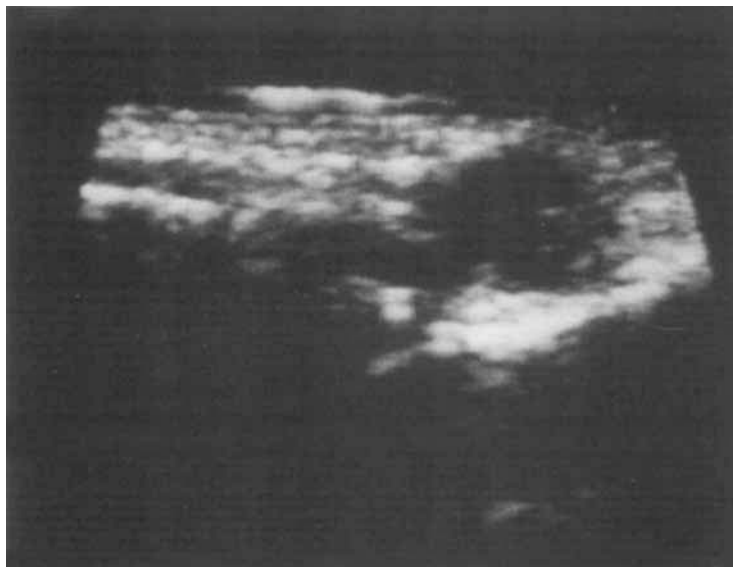


**A**

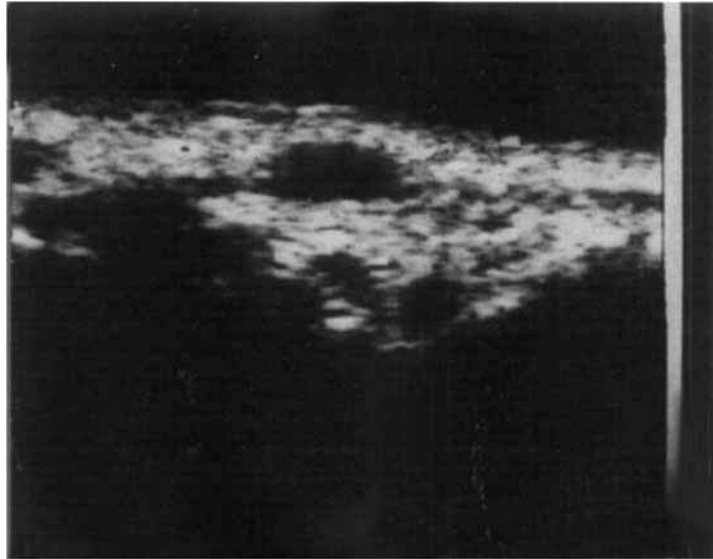
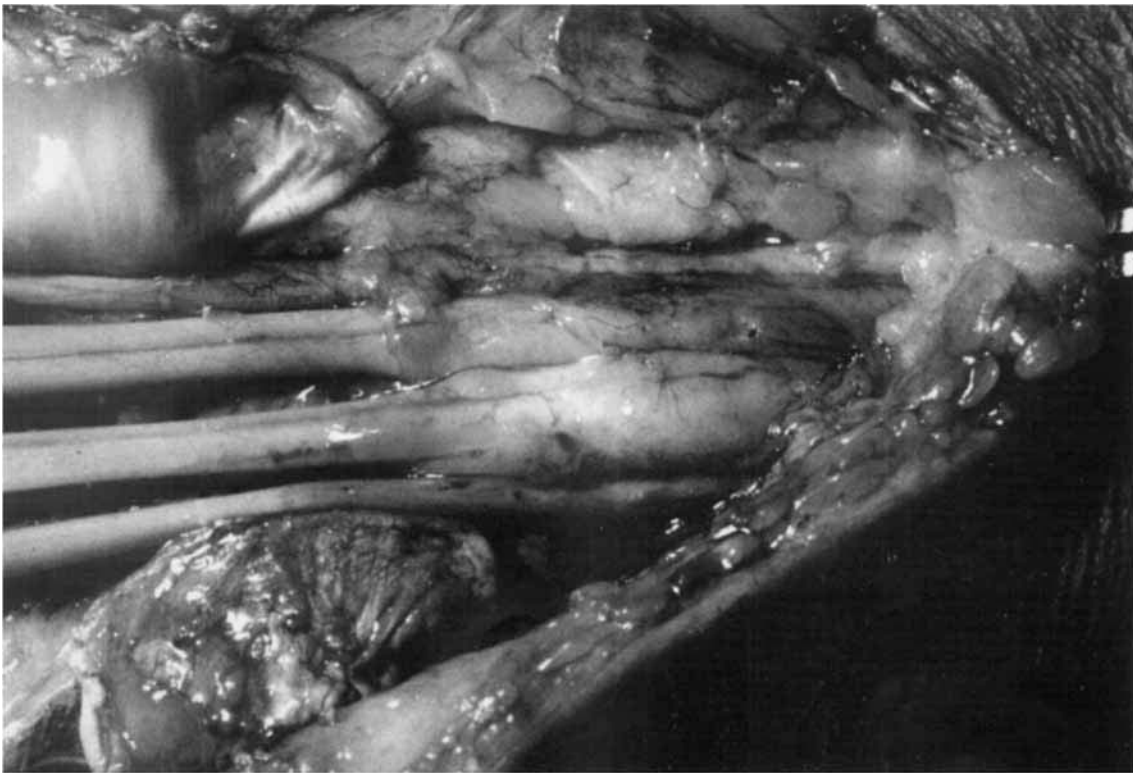


**B**

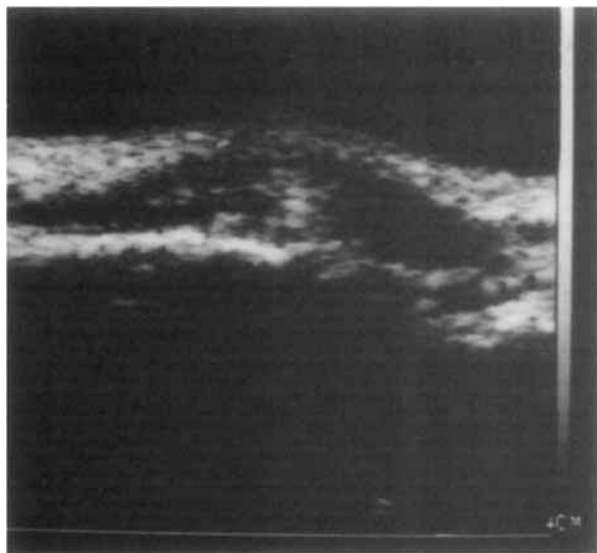
**FIGURE 2.** The echographic aspect (A) of this wrist ganglion is characterized by multiple anechoic cavities grouped in clusters. For comparison, the surgical findings are also presented (B).



**FIGURE 3.** Old recurrent ganglion: the node possesses thick walls and blurred margins. Its content is moderately echogenic because of the presence of organized cystic fluid.

**A****B**

**FIGURE 4.** Cystic tenosynovitis of the extensor tendons of the hand, longitudinal scan (A). The echographic pattern of the lesion shows an anechoic cavity within the tendon sheath without communicating duct. B: For comparison, the surgical findings.



**FIGURE 5.** Longitudinal scan in a case of de Quervain's disease. The soft tissue swelling corresponds to a spindle-shaped enlargement of the tendon containing multiple internal echoes; this corresponds to the stenosis occurring within the tendon sheath.

disease under steroid treatment, echography disclosed a spindle-shaped regular cavity along the tendon sheath, containing multiple internal echoes (Fig. 5). Sonographic examination performed during the abduction of the finger demonstrated enlargement of the lesion because of the tendon's stenosis within the tendon sheath.

### DISCUSSION

The ultrasonographic appearance of cystic lesions of the wrist and hand is rather typical, and it can be studied in detail if high-resolution probes are used. In particular, on the basis of our preliminary experience, differential diagnosis between ganglia and inflammatory conditions such as extensor tenosynovitis is possible.

Ganglia appear echographically as fluid-filled cavities with round or oval shapes and regular borders. Inflammatory swellings of tendon sheaths correspond, in contrast, to longitudinal cavities that follow the tendon's course and possess quite irregular margins. Their differentiation from simple ganglia is very important since they require a different therapeutic approach.

The presence of a communicating duct directed to the articular space is a diagnostic characteristic of ganglia that can be easily demonstrated by high-resolution ultrasonography; in fact, both inflammatory tenosynovitis and de Quervain's disease do not possess the communicating pedicle. The demonstration of this communication can also re-

duce the need for the intraoperative search for the duct, whose obliteration is essential to avoid recurrences. In the case of conservative treatments of ganglia (aspiration, rupture, local steroid injection), echographic monitoring allows an earlier detection of daughter or recurrent cysts, which may show a characteristic thickening of their margins.

Although the diagnostic approach to wrist ganglia is mainly based on clinical findings, the use of a simple and safe imaging procedure such as ultrasonography seems to be highly justified in such cases. The demonstration of the size of the ganglion, of its communicating pedicle, and of multiple clustered cysts are all very useful for correct surgical planning. Ultrasonography allows early detection of recurrences, and the echographic diagnosis makes it possible to differentiate ganglia from other inflammatory diseases causing wrist swelling. High-resolution ultrasonography of wrist ganglia can be easily performed as a complement to clinical examination, and real-time high-resolution small-parts probes (7.5–10 MHz) can be used, in most cases, with standard multipurpose ultrasound scanners.

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