



## Volar retinacular ganglions (flexor tendon sheath ganglions) The results of surgical treatment

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**Volar retinacular ganglions are the third most common group of all ganglions located in the hand and wrist region. The purpose of this work is to present our experience in management and the results of operative treatment of volar retinacular ganglions. One-hundred-and-seven patients were operated-on for volar retinacular ganglions between 2000 and 2014. One-hundred-and-eight ganglions were resected. Complications which were observed in five patients postoperatively (digital nerve irritation, restricted range of motion of digital joints) resolved within several weeks. At final follow-up, no ganglion recurrence, impairment of finger mobility, innervation or blood supply were observed in any of the patients.**

**Keywords :** ganglion cysts ; tendons ; hand ; surgical excision.

### INTRODUCTION

Ganglions are one of the most common tumour types found in the hand and wrist region (4,11,20). They are nonneoplastic lesions surrounded by thin walls composed of collagen fibres. The interior is filled with viscous fluid or jelly-like material (16). Ganglions develop in close proximity to joints or tendon sheaths, with which they communicate through a stalk (4,11,20,22). Dorsal wrist ganglions are most common in clinical practice, while volar wrist ganglions and volar retinacular ganglions

(flexor tendon sheath ganglions) constitute two next most numerous groups (4). The following methods can be used in the treatment of ganglion cysts: observation, aspiration and surgical excision (6-8,14,19,21). The purpose of this work is to present our experience in operative management of volar retinacular ganglions.

### MATERIALS AND METHODS

This study was designed as a retrospective case series. Clinical material consisted of 107 patients: 80 females aged from 14 to 83 years (mean age  $48.3 \pm 17.4$ ) and 27 males aged from 2 to 75 years (mean age  $45.4 \pm 18.4$ ). The mean age of all the patients included in the study was  $47.6 \pm 17.6$  years, the median age was 51 years. The patients were treated between the years 2000 and 2014. The indication for operation was the presence of a nodule located on the palmar side of the fingers or in the distal aspect of the hand. Preoperative evaluation consisted of :

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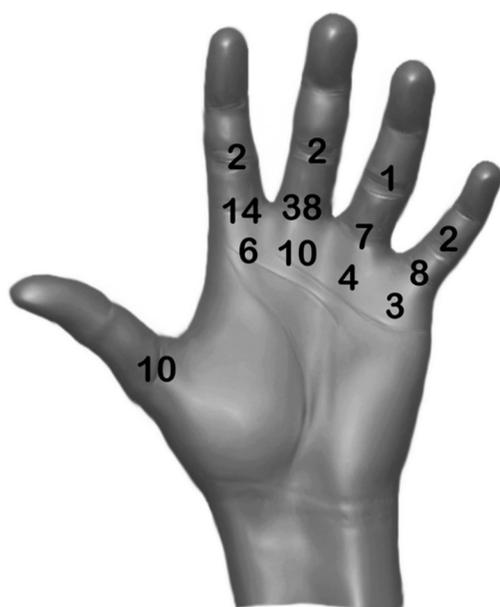
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history and physical examination. Routine MRI (magnetic resonance imaging) was not performed while most of the patients had X-ray and ultrasound examinations done on an outpatient basis. Ninety-nine patients (92.5%) were available for follow-up.

This research received approval from the local Bioethics Committee and from the institution at which it was carried out. All procedures performed in this study were in accordance with 1964 Helsinki Declaration and its later amendments.

The lesions were located in the right hand in 55 patients and in the left hand in 52 patients. Detailed topographical distribution of ganglions is shown in Figure 1 and Table I.



**Fig. 1.** — Detailed topographical distribution of volar retinacular ganglions in the hand. The numbers represent ganglions located in particular regions of the hand

**Table I.** — Detailed topographical distribution of volar retinacular ganglions

Ganglion location	No. of cases male	No. of cases female	No. of cases total	Percentage
1 <sup>st</sup> finger	3	7	10	9.3%
2 <sup>nd</sup> finger	4	18	22	20.6%
3 <sup>rd</sup> finger	13	37	50	46.7%
4 <sup>th</sup> finger	1	11	12	11.2%
5 <sup>th</sup> finger	6	7	13	12.1%
Total	27	80	107	100%

Ganglions were evenly distributed between the right and left upper limb, both in women (the right side – 41 cases, the left side – 39 cases) and in men (the right side – 14 cases, the left side – 13 cases). On clinical examination, the cysts manifested as relatively small, solitary nodules adhering to the underlying tissue and immobile during tendon movements. In none of the patients, significant changes in the size of lesions have been noticed since the moment they were first observed. This refers to a potential enlargement of the cyst over time or after exertion as well as significant decrease in size after periods of rest. The nodules were tender to palpation but caused no rest or night pain. The patients complained of pain aggravation after physical exercise and work, especially after performing tasks that required intense squeezing and grasping. In three cases, the development of a lesion was accompanied by symptoms of trigger finger. These symptoms were observed in a left thumb of an 83-year-old woman, left thumb of a 72-year-old female and left ring finger of a 57-year-old female patient.

The operations were performed in conduction, anaesthesia, and only exceptionally in general or local anaesthesia, with the use of an arm tourniquet. Arcuate skin incision or V-shaped incision was used. The lesion and both neurovascular bundles on two sides of the affected finger were exposed. The ganglion was removed in one piece together with a fragment of retinaculum. In total, 108 ganglion cysts were excised (in one 20-year-old female patient 2 ganglions were removed from her left ring finger). In the postoperative period, a short immobilization (volar forearm plaster splint) was applied until the wound healed. The resected cysts were sent for histopathological analysis.

## RESULTS

All examined lesions were small, unilocular cysts with a diameter ranging from 3 to 9 mm. In each case, histopathological diagnosis revealed a cyst surrounded by a wall made up of collagen fibres organized in layers and filled with gelatinous material.

In the early postoperative period, three patients had manifested symptoms of digital nerve irritation with the presence of paresthesias, that resolved within 4-6 weeks after operation. In other two patients, restricted range of motion of metacarpophalangeal and proximal interphalangeal joints of the operated-on fingers had been detected at early follow-up, which improved after short period of rehabilitation. Neither infection nor symptoms of flexor tendon or digital artery damage have been observed in any of the patients.

At the final follow-up (range 12-72 months), there were no signs of ganglion cyst recurrence in any of the available 99 patients (follow-up rate of 92.5%). In all of the operated-on patients, the mobility, innervation and blood supply of the fingers were normal. Postoperative wounds healed uneventfully, without formation of keloids and in majority of the patients, the scars were hardly visible.

## DISCUSSION

Flexor tendon sheath ganglions are the third most common group of all ganglions located in the

hand and wrist (4). However, not many works have been dedicated solely to this type of ganglions. The first article dealing with volar retinacular ganglions alone dates back to 1973 (18). Clinical data extracted from consecutive articles about operative treatment of volar retinacular ganglions are presented in Table II. As can be seen from the table, this type of ganglions is more common in women (1,5,9,13,18). Only observations made by Al-Khawashki et al. differed in this aspect (3). In their patients, volar retinacular ganglions were more frequent in men (3).

Our patients constituted a homogeneous group with respect to the therapeutic method used. None of the patients had the ganglion cyst aspirated, neither during hospitalization nor earlier on an outpatient basis. The analysis of our patients' history revealed that in cases of ganglions located in the fingers/distal aspect of the hand, outpatient health care physicians are less likely to perform aspiration in comparison to ganglions located in other parts of the upper limb (eg. wrist). This is associated with difficulties connected with a puncture of a small cyst and the risk of damage to digital nerves and vessels (2,10,13,15). Bittner et al., having analysed clinical

Table II. — Published results of surgical treatment of volar retinacular ganglions

Authors	No. of cases (male/ female)	Mean age age range (m – months, y – years)	Total no. of ganglions	No. of excised ganglions	Postoperative follow-up period (months)	No. of operated- on followed-up patients	Recurrences (no. of cases)	Complications (no. of cases)
Matthews (1973)	40 (12/28)	28.8y 7m-73y	41	34	3-36	34	0	0
Jebson, Spencer (2007)	24 (9/15)	43y 21y-68y	25	25	5-38	24	0	2* (temporary – 2)
Finsen et al. (2013)	28 (13/15)	38y 13y-64y	28	28	36-132	24	1	4** (permanent – 1, temporary – 3)
Abe et al. (2004)	128 (36/92)	43y 13y-82y	139	133	1-240	133	0	0
Bittner et al. (2002)	175 (48/127)	49y 21y--84y	175	43	no data available	43	1	0
Our study	107 (27/80)	47.6y 2y-83y	108	108	12-72	99	0	5*** (temporary – 5)

\* - mild incisional tenderness – 1 case

- transient digital nerve paresthesias – 1 case

\*\* - small sterile abscess in the scar – 1 case

- flexor tenosynovitis – 1 case

- cold hypersensitivity and limited extension of the operated finger at the MCP (metacarpophalangeal) joint – 1 case

- permanent digital nerve injury – 1 case

\*\*\* - transient irritation of digital nerves with the presence of paresthesias – 3 cases

- temporary limitation of MCP and PIP (proximal interphalangeal) range of motion – 2 cases

material consisting of 175 cases (including 43 treated operatively) concluded that it is most cost-effective to perform two aspirations before a patient is scheduled for an operation (5). In our opinion, it is important to consider patient's preferences when choosing the treatment method. When presented with treatment options, our patients tended to opt for surgery. Although only a few of them verbalized their anxiety about possible neoplastic character of the lesion, all patients expected histopathological assessment of resected material. The great majority of the patients decided for operative removal of a ganglion cyst, despite having been informed about other treatment options (aspiration, observation). The reasons for choosing surgery included pain of varying intensity triggered by pressure to the nodule and impairment of manual dexterity, manifested by handgrip strength weakening and decreased ability to lift heavy objects. There has been a clear disparity between relatively small sizes of lesions and intensity of symptoms caused by them. Unlike in the case of other locations of ganglions, in our patients cosmetic aspects played no role in decision making (17). Although volar retinacular ganglions are easily accessible to palpation, they can also easily be missed due to their small size and location on the inner aspect of the hand and fingers (5).

The typical location and characteristic clinical symptoms allow preliminary diagnosis of volar retinacular ganglions already in the preoperative stage. Other tumours have to be considered in the differential diagnosis of volar retinacular ganglions (5,12,18,22). In our patients, the results of histopathological examination of resected lesions confirmed the diagnosis of a ganglion cyst. As demonstrated by Lawson et al. in their study, the structure of volar retinacular ganglions does not differ from this of ganglion cysts located elsewhere and despite their small sizes, they also lack synovial lining (16).

The location of flexor tendon sheath ganglions varied in clinical materials presented by individual authors (1,5,9,13,18). Still, the most common location of ganglions according to all of the above mentioned authors was the middle finger with corresponding metacarpophalangeal joint (1,5,9,13,18). Similarly, in our material almost half of all volar retinacular

ganglions were located within the third ray. Ganglions most frequently arose from A2 pulley (67 cases) – see Figure 1. This is consistent with observations made by Matthews, Abe et al. and Bittner et al. but differs from those by Jebson and Spencer, in whose case series ganglions were most commonly located at the level of A1 pulley (1,5,9,13,18).

According to Abe et al.: “distribution according to specific finger location seems to confirm with the theory of hyperload. Ganglions most commonly appeared at the A1 to A2 pulley region. The A1 pulley is known to have high angular loads and thus a common site for stenosing tenosynovitis. The A2 pulley on the other hand bears the greatest amount of friction and load during use as it prevents bowstringing” (1).

The role of trauma in ganglion formation remains unexplained. Matthews concluded that: “a single specific injury is unlikely to be an important factor in the formation of ganglia of the flexor tendon sheaths. However, repeated minor trauma may play some role in etiopathogenesis of the volar retinacular ganglia” (18). On the other hand, an analysis performed by Al-Khawashki et al. contradicted the existence of a connection between repeated trauma or type of occupation and formation of volar retinacular ganglions (3).

When performing surgical excision of volar retinacular ganglions, it is necessary to resect the cyst along with a cuff of tendon sheath. In the part of tendon sheath in contact with the ganglion, the presence of microscopic cysts have been described (9,18). Failing to remove them may result in development of symptomatic ganglions (2,9,18).

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