Nodular giant cell tumour of the tendon sheath of the hand: analysis of eighty-four cases—diagnostic decisions and outcome

Martin Lautenbach · Simon Kim · Michael Millrose ·
Andreas Eisenschenk

Received: 11 May 2013 / Accepted: 18 June 2013 / Published online: 9 July 2013
© Springer-Verlag Berlin Heidelberg 2013

Abstract

Introduction The giant cell tumour of the tendon sheath (GCTTS) of the hand is a benign tumour of unknown origin. The clinical diagnosis is supported by preoperative imaging. But the ideal imaging methods necessary for the diagnosis, preoperative planning and total tumour resection are still debated. Standard treatment is surgical resection with histological confirmation.

Methods We followed up 84 patients who were operated upon for a histologically confirmed nodular type GCTTS for an average of 4.7 years (range four to eight). The preoperative symptoms and radiological findings of X-ray, ultrasound and MRI were reviewed and the surgeon asked for their impact on the surgical procedure.

Results The average age at operation was 50.9 years, 65.5 % of the patients were female and 61.9 % of the lesions were located on the palmar aspect. Most tumours were found on the first three fingers. Two patients had tumours at two separate sites (2.4 %). After an average follow up of 31.5 months two recurrences were observed (2.4 %). In addition to X-ray and ultrasound, the preoperative findings of the MRI had no influence on the surgical procedure.

Conclusion Our data on the nodular GCTTS are in accordance with published data concerning the age distribution,

gender distribution, and localisation. No soft-tissue imaging method is superior for the diagnosis of nodular GCTTS or for the preoperative planning. A preoperative MRI may not be necessary as clinical and ultrasound examination are sufficient. To exclude bony erosions, a preoperative X-ray is necessary.

Introduction

The giant cell tumour of the tendon sheath (GCTTS) of the hand is a benign tumour of unknown origin that can be classified into a nodular and a diffuse type. In current literature the term GCTTS is not used uniformly [7, 16]. Here we report only of the nodular type separate from pigmented villonodular synovitis. It may present in a plain radiograph as a soft tissue shadow. MRI and ultrasound can support the diagnosis, but there are no recommendations as to which are necessary and reasonable or could be omitted. Influencing factors are additional information on the extent, localisation and involvement of surrounding structures, the influence on the surgical procedure, the cost effectiveness and patient comfort. The aim of this study is to give epidemiological data specific for the nodular type of GCTTS, follow up results and a recommendation regarding the preoperative assessment.

The standard treatment is surgical complete marginal resection. Postoperative radiation therapy is discussed in literature [11]. One major problem can be the recurrence rate that is reported to be between four and 45 % [1, 4, 17].

Methods

Searching the database of our hospital, we identified 84 patients who were operated upon between 2001 and 2008 for a giant cell tumour of the hand or wrist with a

M. Lautenbach · S. Kim (✉)
Department for the Upper Extremity, Hand-, and Microsurgery,
Immanuel Hospital, Königstr. 63, 14109 Berlin, Germany
e-mail: simon.kim@uni-greifswald.de

M. Millrose · A. Eisenschenk
Department for Hand-, Replantation- and Microsurgery,
Unfallkrankenhaus Berlin, Warener Straße 7, 12683 Berlin,
Germany

S. Kim · A. Eisenschenk
Centre for Hand Surgery, University Hospital Greifswald,
F.-Sauerbruch-Straße, 17475 Greifswald, Germany

Fig. 1 Occurrence of the tumour in number per location. I–V digits 1–5, Palma palm, P1 proximal phalanx, P2 middle phalanx, P3 distal phalanx, DIP distal interphalangeal joint, PIP proximal interphalangeal joint, MP metacarpophalangeal joint

histologically confirmed diagnosis of the nodular type of GCTTS. Medical records were reviewed and patients invited for follow up. The ethics committee of the hospital approved the study; all patients were informed that the data would be used for a study and consented. The analysed data include age of the patient at operation, gender, and localisation of the tumour, dominant hand side, recurrence, and first appearance of the tumour, trauma before occurrence, and symptoms which led to the patient's presentation. All patients were examined preoperatively clinically and by ultrasound, X-ray and MRI. The ultrasound examination was performed by the surgeon. The surgeon was asked if the radiographic and intra-operative appearance matched and if there was an examination that could have been omitted. Statistical analysis was performed using the binomial test for distribution and Fisher's exact test for differences between patients with and without recurrence. Statistical significance was assumed for $p < 0.05$.

Fig. 2 Preoperative finding. The palpable mass is encircled on the palm of a left hand

Results

All 84 patients with histologically confirmed giant cell tumour of the tendon sheath of the hand could be reviewed after an average follow up of 4.7 years (SD 0.97, range four to eight years). Average age at operation was 50.9 years (SD 15.6, median 51.5, range 17–80). There were 55 female patients (65.5 %) and 29 male patients (34.5 %) ($n=84$, $p=0.006$, binomial test). The tumour was found in 51 cases (60.7 %) on the right hand (38 female, 13 male), the dominant hand for 50 patients, and in 33 cases on the left hand, the dominant hand for 13 patients. In total the dominant hand was operated on in 63 cases (75 %) which is significantly more often than the non-dominant hand ($n=84$, $p < 0.001$, binomial test). The right hand was not significantly more often operated than the left ($n=84$, $p=0.064$, binomial test). In two cases the tumour was located at two separate sites (2.4 %): one patient had the tumour on the proximal interphalangeal joint of digits III and IV, and the other on the distal phalanx of the thumb and on the distal interphalangeal joint of digit V. Seven patients were operated upon for a recurrence of the tumour (8.3 %); one patient was operated for a re-recurrence (1.2 %).

The distribution of the tumors is shown in Fig. 1.

Fig. 3 Intraoperative findings. u ulnar, p proximal, r radial, d distal, star tumour, T tendon, arrow palmar arc. **a** Tumour in situ, note the close relationship to the palmar arc. **b** The tumour is attached to the tendon

With 60 cases (71 %), the tumour was found significantly more often on the palmar aspect of the finger or hand ($n=84$, $p=0.38$, binomial test) (Fig. 2). The first three fingers were significantly more often affected than the other fingers ($n=74$, $p=0.008$, binomial test).

In four palmar cases the flexor digitorum profundus tendon and in one case the flexor pollicis longus tendon were involved (Fig. 3).

Symptoms on presentation were a palpable mass (all patients), pain (one patient, 1.2 %), altered skin sensation (two patients, 2.4 %), and trigger finger (three patients, 3.6 %). The range of motion of the hand or fingers was not affected in any patient. An injury to the affected hand was reported by seven patients (8.4 %).

The tumour was noticed by 54 patients on average 19.3-months (SD 20.1, mean 12, range 6–84 months) before the operation. Two patients had the symptoms for more than ten-years. The remaining 28 patients could not say when they first noticed the tumour. Two patients who had two separate tumours on the hand noticed it within a year.

In all cases a capsule was seen intraoperatively; one tumour was described by the surgeon probably of the localised nodular type and the remaining most likely as of the localised nodular

type. Histological analyses resulted in the classification of nodular type tumours in all cases. Bony impressions were seen in 17 patients (20.2 %); in three patients satellite nodules were found (3.6 %). In three patients the tumour reached into the joint (two PIP-joints, one DIP-joint) (3.6 %).

The radiographic examinations showed congruent findings regarding size and localisation in 84 of 84 cases by ultrasound, 13 of 84 cases by X-ray and 84 of 84 cases by MRI. X-ray was only used to look for bony impressions; no soft tissue changes were identified. For tumours of the palm MRI could not show adhesions with the tendon and the spatial relationship to the palmar arcs (Fig. 4). Dynamic and doppler examination by ultrasound could show adhesions and the relationship of the tumour to vessels (Fig. 5). The X-ray and ultrasound findings were considered as sufficient by the surgeon in all cases; the MRI findings did not influence the surgical procedure. The operative procedure was local excision using magnifying glasses. No postoperative radiation therapy was performed.

In two cases a recurrence occurred (2.4 %). In one patient the recurrence appeared three years after the operation with a recurrence of the tumour on the fifth finger of the right hand. The other patient was operated upon twice before on the index

Fig. 4 MRI images. *Star* tumour. **a** T1 coronary. **b** T2 coronary. **c** T1 transverse. **d** T1 sagittal

Fig. 5 Ultrasound images. *Star* tumour, *t* tendon, *m* metacarpal bone, *arrow* palmar arc. **a** Transverse. **b** Sagittal

finger and developed the recurrence two years after the operation. In neither case was bony erosion seen in the preoperative X-ray.

Statistical analysis showed no significant difference between patients who were initially operated upon for a recurrence and those without recurrence regarding the age, gender, location (palmar vs rest) and bony impressions in X-ray ($n=84$, $p>0.05$, Fisher's exact test).

Discussion

The average age of our patients at 51 years was in the upper range compared to the reported average age of 32–51 years [4, 15, 17]. As in those reports we also have a higher prevalence of female patients which is significant for the nodular type of GCTTS of the hand. Significantly more tumours were found on the first three digits and on the palmar surface which is also consistent with previously published data on GCTTS without differentiation on the type [4, 14, 15, 17]. Ikeda et al.

presented ten cases of nodular GCTTS and found 50 % of the tumours on the last two fingers [7].

In a review by Fotiadis et al. an average recurrence rate of 14.8 % was noted with a non-significant lower rate for operations performed using magnifying glasses or microscopes [4]. The low rate of recurrence in our patients (2.4 %) during the observed period may support the use of magnification aids for this operation. As the operations were done in a specialised hand surgical hospital, the experience of the surgeon might have an impact. However, continuous follow up is required as a recurrence can develop after up to nine years [8].

Both patients with a recurrence had a previous recurrence. This would support the theory that there are different subtypes of GCTTS with different risks for recurrence. This was suggested by Grover et al. and Lorea et al. [5, 12]. Both groups investigated the influence of the nm23-H1 gene on the recurrence of GCTTS but found contradicting results. Thus further research is needed to filter patients who are prone to a recurrence and need regular follow up.

The dominant hand was operated upon more often than the other hand. This may be due to discomfort in the daily life because of the mass leading to a presentation.

Preoperative X-ray studies are needed in any tumour-like lesions to examine the grade of bony changes or detect invasion. Soft tissue examination can be performed by ultrasound and MRI. The diagnostic value of ultrasound imaging in suspected GCTTS was described by Middleton et al. [13]. It can show attachment of the tumour to the tendon sheath and whether there are satellite-lesions present. The tumour presents as a hypoechoic, hyperechoic, or in rare case heterogeneous solid mass with detectable blood flow adjacent to the tendons [10, 13]. One disadvantage is the similarity between the presentation of a ruptured ganglion cyst and a GCTTS [3]. Preoperative MRI can give further information on the vascularisation of the tumour [3, 9]. In our cases it did not give any additional information that would have changed the surgical procedure. Nevertheless, a complete examination of the tendon is recommended as the tumour can develop at two different sites in rare cases [2]. Until histological examination, the tumour cannot be differentiated from the pigmented villonodular synovitis, or fibroma of the tendon sheath [6, 9].

In our opinion only an X-ray and ultrasound examination are required for the clinical diagnosis of a GCTSS. The MRI was proven to show the three-dimensional extent of the tumour but a definite diagnosis cannot be drawn due to the heterogeneity. Depending on the resolution, an ultrasound scan can show satellite lesions and thus influence the operative approach. But as the experience of the investigator is important, an MRI may be needed in some cases. We want to stress that even if our results may be similar to previous published results regarding the epidemiology and distribution, the different entities gathered under the term GCTT should be researched separately. With increasing numbers,

significant differences may appear that have an impact on the treatment and outcome.

Conclusion

The nodular type of giant cell tumour of the tendon sheath of the hand occurs more often in women than in men with the highest prevalence around 50 years of age. It is more common in the first three digits of the hand and occurs more often on the palmar side of the dominant hand. A lower recurrence rate could be influenced by using a magnifying aid to ensure complete excision. A hand surgical training might be beneficial. Depending on the preoperative X-ray and ultrasound imaging an MRI is not necessary in all cases as it gives no additional information, is more expensive, time consuming and may be difficult to obtain in patients with claustrophobia.

References

1. Adams EL, Yoder EM, Kasdan ML (2012) Giant cell tumor of the tendon sheath: experience with 65 cases. *Eplasty* 12:e50
2. Altaykan A, Yildiz K, Hapa O et al (2009) Multifocal giant cell tumor of the tendon sheath occurring at different localizations of the same tendon of a finger: a case report and review of the literature. *Ekleml Hastalik Cerrahisi* 20:119–123
3. Bassetti E, Candreva R, Santucci E (2011) Giant cell tumor of the flexor tendon of the wrist: US and MRI evaluation. Case report. *J Ultrasound* 14:37–39
4. Fotiadis E, Papadopoulos A, Svarnas T et al (2011) Giant cell tumour of tendon sheath of the digits. A systematic review. *Hand (NY)* 6:244–249
5. Grover R, Grobbelaar AO, Richman PI et al (1998) Measurement of invasive potential provides an accurate prognostic marker for giant cell tumour of tendon sheath. *J Hand Surg Br* 23:728–731
6. Horcadas AB, Lafuente JL, De La Cruz BR et al (2003) Ultrasound and MR findings in tumor and tumor-like lesions of the fingers. *Eur Radiol* 13:672–685
7. Ikeda K, Osamura N, Tomita K (2007) Giant cell tumour in the tendon sheath of the hand: importance of the type of lesion. *Scand J Plast Reconstr Surg Hand Surg* 41:138–142
8. Jalgaonkar A, Dhinsa B, Cottam H et al (2011) Giant cell tumours of tendon sheath of hand: causes and strategies to prevent recurrence. *Hand Surg* 16:149–154
9. Jelinek JS, Kransdorf MJ, Shmookler BM et al (1994) Giant cell tumor of the tendon sheath: MR findings in nine cases. *AJR Am J Roentgenol* 162:919–922
10. Kato H, Minami A, Hirachi K et al (1997) Treatment of flexor tendon sheath ganglions using ultrasound imaging. *J Hand Surg Am* 22:1027–1033
11. Kotwal PP, Gupta V, Malhotra R (2000) Giant-cell tumour of the tendon sheath. Is radiotherapy indicated to prevent recurrence after surgery? *J Bone Joint Surg Br* 82:571–573
12. Lorea P, Van De Walle H, Kinnen L et al (2004) Giant cell tumours of the tendon sheath: lack of correlation between nm23-H1 expression and recurrence. *J Hand Surg Br* 29:67–70
13. Middleton WD, Patel V, Teefey SA et al (2004) Giant cell tumors of the tendon sheath: analysis of sonographic findings. *AJR Am J Roentgenol* 183:337–339
14. Monaghan H, Salter DM, Al-Nafussi A (2001) Giant cell tumour of tendon sheath (localised nodular tenosynovitis): clinicopathological features of 71 cases. *J Clin Pathol* 54:404–407
15. Oyemade GA, Abioye AA (1977) A clinicopathologic review of benign giant cell tumors of tendon sheaths in Ibadan, Nigeria. *Am J Surg* 134:392–395
16. Van Der Heijden L, Gibbons CL, Dijkstra PD et al (2012) The management of diffuse-type giant cell tumour (pigmented villonodular synovitis) and giant cell tumour of tendon sheath (nodular tenosynovitis). *J Bone Joint Surg Br* 94:882–888
17. Williams J, Hodari A, Janevski P et al (2010) Recurrence of giant cell tumors in the hand: a prospective study. *J Hand Surg Am* 35:451–456