Glomus Tumors: A Review of Preoperative Magnetic Resonance Imaging to Detect Satellite Lesions

JUAN M. GIUGALE, MD; JOHN R. FOWLER, MD

abstract

Glomus tumors are malformations of the neuromyoarterial system that commonly develop in the digits and cause exquisite tenderness, especially with cold temperatures. Treatment typically involves surgical excision, although there is a tendency to avoid aggressive resections, which may lead to aesthetically displeasing nail plate deformities. In a minority of patients, symptoms may persist and the tumor may recur. The etiology of the persistent of symptoms is debatable. One theory for the persistence of symptoms is an incomplete initial excision of the glomus tumor. Another theory suggests that clinically unapparent satellite lesions exist at the time of diagnosis that are not excised, and they later mature into symptomatic recurrent tumors. Although not clinically visible, if present, these satellite lesions should be seen on preoperative magnetic resonance imaging. The authors reviewed all cases of pathology-confirmed glomus tumors in the past 7 years at a single institution in which preoperative magnetic resonance imaging using a high-powered 3.0 Tesla (General Electric, Buckinghamshire, United Kingdom) magnet was performed. Six cases met inclusion criteria and only 1 case developed a recurrent glomus tumor. None of the cases were found to have satellite lesions associated with the primary glomus tumor on magnetic resonance imaging. Preventing recurrence seems to be dependent on the completeness of the initial excision. Preoperative magnetic resonance imaging is a valuable tool used to delineate the extent of the tumor for surgical planning. [Orthopedics. 2015; 38(10):e888-e890.]

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Glomus tumors are rare, benign lesions that typically form in close proximity to the nail bed of the digits. They are believed to arise from the neuromyoarterial glomus system, which is presumed to play a role in skin circulation and body temperature regulation.\(^1\)

Patients with these tumors will present with symptoms of pain that worsens with contact and cold exposure.\(^2\)

Although surgical excision is thought to be curative, recurrent lesions have been described, with an incidence rate of 5% to 17%.\(^3,4\) The etiology behind recurrent lesions is controversial. Early literature suggested that recurrence is secondary to incomplete excision of the lesion.\(^5\) More recent evidence lends support to the notion that tumor recurrence is due to microscopic noncontiguous or “skip” lesions that are not apparent during clinical presentation or at the time of surgery.\(^6\)

Magnetic resonance imaging (MRI) has been shown to be a sensitive diagnostic tool used in the diagnosis and preoperative determination of glomus tumor location.\(^7,8\) However, these studies used a 1.0-1.5 Tesla (Signa; GE Medical System, Milwaukee, Wisconsin) magnet MRI and do not discuss the possibility of skip lesions in their findings.

The current authors reviewed all cases of glomus tumor at a single institution in which a preoperative high-resolution 3.0 Tesla (General Electric, Buckinghamshire, United Kingdom) magnet MRI was taken to assess whether satellite lesions were identifiable.

**Materials and Methods**

After obtaining institutional review board approval, a search of all patients having undergone excision of hand lesions by one practice of 5 orthopedic surgeons in the past 7 years was conducted using CPT Codes (26115, 26116, 26160). Inclusion criteria included a pathology report confirming glomus tumor diagnosis and a preoperative MRI. The patient’s medical information, MRI images, pathology, and operative report were retrospectively reviewed. A total of 811 cases using the stated CPT codes were identified; 7 cases of glomus tumor were found, 6 of which had a preoperative MRI available for review. In all cases, the MRI images were performed using a 3.0 Tesla magnet MRI. The MRI reports and images were reviewed by the authors to identify primary and potential skip lesions.

**Results**

Six cases of glomus tumor that were confirmed by pathology and had undergone a preoperative MRI were reviewed. All patients were women, with an age range of 30 to 66 years. All patients underwent surgical excision of their lesion. Only 1 patient developed a recurrent tumor, which occurred in the same location as the initial lesion (Table). This patient underwent repeat surgical excision 2 years after the index procedure. The MRIs, including those pertaining to the patient with tumor recurrence, demonstrated a well-circumscribed lesion without any associated noncontiguous lesions (Figures 1-2).

**Discussion**

The debate regarding the etiology of recurrent lesions began as early as the 1970s. Carroll and Berman\(^5\) published a case series of 28 glomus tumors and stated that persistent symptoms were secondary to incomplete excision. In 1979, Maxwell et al\(^9\) published their series of 28 cases, 15% of which developed persistent symptoms. In 3 of these cases, multiple glomus tumors of the involved digit were discovered at the time of surgery, suggesting that recurrence is likely secondary to unidentified satellite lesions.\(^9\)

Gandhi et al\(^6\) reviewed 5 cases of recurrent tumors and depicted the location of recurrent lesions in comparison to the initial lesion. In all 5 cases, the recurrent

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**Table**

<table>
<thead>
<tr>
<th>Age, y</th>
<th>Gender</th>
<th>Tumor Location</th>
<th>Recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>Female</td>
<td>Right index finger, eponychial fold</td>
<td>No</td>
</tr>
<tr>
<td>66</td>
<td>Female</td>
<td>Left small finger, subungual</td>
<td>Yes</td>
</tr>
<tr>
<td>30</td>
<td>Female</td>
<td>Right small finger, radial subungual</td>
<td>No</td>
</tr>
<tr>
<td>59</td>
<td>Female</td>
<td>Left thumb finger, subungual</td>
<td>No</td>
</tr>
<tr>
<td>49</td>
<td>Female</td>
<td>Right thumb finger, subungual</td>
<td>No</td>
</tr>
<tr>
<td>36</td>
<td>Female</td>
<td>Right middle finger, subungual</td>
<td>No</td>
</tr>
</tbody>
</table>
lesion was clinically found to be in a different anatomic location within the same digit as the first excised tumor. This supports the notion that recurrent tumors are not necessarily the result of incomplete excisions. In contrast, in the current study, in the 1 patient with recurrence, the location of the tumor was in the same anatomical location as the primary lesion.

Lin et al. reviewed 75 cases of glomus tumor with recurrence developing in 13 (17%) cases. They found that lesions that were skin-colored or underneath the nail matrix were more likely to recur. Interestingly, in no cases in which a preoperative MRI was obtained did the lesion recur. The study alludes to incomplete excision as the cause of recurrence because skin-colored lesions are more difficult to visualize intraoperatively and excising nail-matrix lesions may lead to a more minimalistic operation to prevent the development of dystrophic nails. The single case of recurrence at the current institution supports these findings. The lesion was near the nail-matrix and the initial procedure preserved the nail plate. The revision procedure involved a longer incision and complete removal of the nail plate in an effort to get a complete excision of the lesion.

The sensitivity of MRI to detect glomus tumors has been documented at 90%. The authors believe MRI is a valuable tool that can be used not only to delineate the extent of the primary lesion, but also to unveil clinically hidden lesions that may not be visibly apparent to the clinician. Dalrymple et al. presented a case report of recurrent symptoms after excision of a clinically identified and pathology-confirmed glomus tumor. Subsequent MRI demonstrated a mantle of multiple lesions in the affected digit. The patient underwent revision excision of all lesions found on MRI and symptoms resolved. Similar case reports have been published of multiple glomus tumors involving a single digit. In these cases, it would seem that these lesions arise independently because they are separated by a relatively large distance.

In the current review, 1 (17%) of 6 cases developed recurrence, which is in the range of that reported by several studies. No satellite or skip lesions were evident in the preoperative MRIs performed with a modern 3.0 Tesla magnet MRI. The 1 case of recurrence is believed to be secondary to incomplete excision because it developed in the same anatomical location and no skip lesions were evident on MRI.

Whether recurrent glomus tumors are the result of incomplete excision or the presence of skip lesions remains controversial. The current study, although limited by a small sample size and retrospective review, would support the idea that the etiology of recurrence is incomplete excision. Complete excision while achieving a cosmetically pleasing outcome is challenging. The use of a microscope intraoperatively may increase the likelihood of achieving tumor-free margins and decrease the possibility of recurrence while minimizing the amount of healthy tissue resected with the tumor. The case reports and series found in the literature support the notion that in certain patients, multiple independent glomus tumors may be present despite not all tumors being clinically apparent. In this setting, MRI becomes a crucial diagnostic tool both to delineate the visible lesion and to detect lesions that are hidden from the clinician’s eye.

REFERENCES