



Original Article

Nonpalpable intramuscular hemangioma treated with hookwire localization and excision

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Abstract

Background: The local recurrence rate after surgical excision of intramuscular hemangioma reported is between 18% and 61%. The aim of this study was to review the clinical outcome and local recurrence rate after surgical excision of nonpalpable intramuscular hemangioma using preoperative ultrasound-guided hookwire localization.

Methods: We performed ultrasound-guided hookwire localization before excision surgery for nonpalpable intramuscular hemangioma in 37 cases between January 1997 and 2011. There were 20 females and 17 males, with a mean age of 30.2 years (range, 17–49 years). The mean localization procedure time was 10.6 minutes (range, 3–20 minutes).

Results: The average operation time was 48.6 minutes (range, 30–80 minutes). The average length of the excision wound was 5 cm (range, 4–11 cm), and the average hospital stay was 2.5 days (range, 2–4 days). The postoperative therapeutic report confirmed the diagnosis of intramuscular hemangioma. The average tumor size was 2.11 cm and all excision margins were free in all specimens. After the mean follow-up of 92.9 months (range, 14–179 months), one of the 37 patients had local recurrence (recurrence rate 2.7%).

Conclusion: The use of ultrasound-guided hookwire localization before excision surgery is safe and effective in treating nonpalpable intramuscular hemangioma and could provide a better cosmetic result and functional recovery.

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Keywords: hemangioma; localization; local recurrence

1. Introduction

Intramuscular hemangioma (IMH) is one of the most common deep-seated soft tissue tumors and is the most common benign tumor in muscles,¹ comprising 0.8% of all hemangiomas.² IMH occurs in patients of all ages but is most frequent in young adults, with 80–90% occurring before the

age of 30.³ Pain is the most common symptom.⁴ In the limbs, symptoms are consistent with expansion during times of increased blood flow into the vascular spaces of the lesion.⁵ With more advanced imaging modalities, lesions can be discovered earlier than before. It is rare for IMH to be palpable at the time of diagnosis.

Surgical treatment is indicated for the relief of symptoms or cosmetic purposes.⁶ However, due to the inherent characteristics of the deep-seated intramuscular location of IMH, adequate surgical resection is difficult to achieve. Thus the outcome varies, with a local recurrence rate of 18–61%.^{4,7–10} However, the surgical margin is the major determinant for local recurrence.^{7,10} Due to the infiltrative

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nature of IMH, normal muscle must be removed well beyond the gross limits of the tumor for local recurrence prevention. This may cause unnecessary surgical trauma and bleeding.

Presurgical ultrasound-guided localization of nonpalpable breast lesions is now the most commonly used presurgical guiding procedure for nonpalpable breast cancers, with reliable success rates.^{11–16} We suggest the exact presurgical localization of the lesion is quite important for achieving optimal surgical outcome in the treatment of IMH. In this study, we performed ultrasound-guided hookwire localization to identify and mark nonpalpable IMH prior to excision in an attempt to enable complete surgical removal, thus reducing the recurrence rate with the added benefit of reduced tissue trauma and a better cosmetic result.

2. Methods

2.1. Patients

Fifty-one patients with IMH who were treated with surgical excision following ultrasound-guided hookwire localization between January 1997 and 2011 by a single orthopedic surgeon (W.M. Chen) were reviewed. Our surgical indications for IMH excision included: (1) symptoms persist or progress under conservative treatment; (2) size of tumor progresses during follow up; and (3) the patient requests the procedure. All IMHs were diagnosed by an experienced radiologist (H.J. Chiou), and had the typical imaging features of being well-defined, lobulated, heterogeneous, and showed evidence of vascularity on ultrasound and magnetic resonance imaging (MRI).¹⁷ Fourteen patients with 14 palpable masses were excluded. Thirty-seven patients with nonpalpable IMH who received ultrasound-guided hookwire localization and surgical excision were included. There were 17 males and 20 females. The average age at the time of first evaluation was 30.2 years (range, 17–49 years). Twenty-three lesions arose from the thigh; 12 of those originated in the vastus lateralis muscle, seven originated in the vastus medialis and the remaining four arose from the vastus intermedius muscle. Ten lesions arose from the lower leg, six of those originated in the soleus muscle, and two came from the gastrocnemius muscle. Four IMHs originated in the upper limbs. Three of those originated in the triceps muscle and the one remaining arose from the deltoid muscle. The average duration of symptoms was 18.5 months (range, 5–48 months). The average tumor size (largest diameter on ultrasonography) was 2.11 cm (range, 0.8–4.5 cm).

2.2. Intervention

All ultrasound-guided procedures were performed within 3 hours before the surgical procedure by a single radiologist (H.J. Chiou). Free-hand ultrasound guidance was performed under local anesthesia in the ultrasound examination room (Fig. 1A). The needle that carried the hookwire was percutaneously inserted, passed through the lesion, and placed at the

deepest part of the lesion. The wire used for localization had a hooked tip that could be fixed in the soft tissue (Fig. 1B). The ultrasonography pictures taken during the procedure were available for the surgeon to make comparisons and correlations between the wire and the lesion. In order to facilitate viewing of the tumor, tourniquets were placed on the patients' limbs preoperatively and were inflated without elastic bandage exsanguinations. Marginal excision was performed following down the hookwire, which was located at the deepest part of the lesion (Fig. 1C–E). No other preoperative procedures (e.g., needle biopsy) were performed before the excision operation.

2.3. Clinical and radiological evaluation

Clinical symptoms, and preoperative imaging including radiography, ultrasonography and MRI were investigated for all patients. The histopathological results, especially the surgical margin were reviewed. All patients were followed up at 3-month intervals for the 1st year after surgery, then annually. During follow up, we assessed the patients' symptoms and detailed palpation. If recurrence was suspected, additional ultrasonography or MRI was then performed. The mean period of follow up was 92.9 months (range, 14–179 months). This study project is approved by the Institutional Review Board of Taipei Veterans General Hospital.

3. Results

In our study, almost all clinical symptoms were spontaneous pain in the affected area; only one patient complained of progressive swelling during exercise with mild discomfort.

Tumors were evaluated by radiography, ultrasonography, or MRI. For plain radiography, 34 out of 37 patients were normal; only three revealed phleboliths. All of our patients revealed typical imaging findings in both ultrasonography and MRI.

The average time for localization was 10.6 minutes (range, 3–20 minutes). No procedure-related complications such as wire migration, wire transection, or neurovascular injury were noted. Mean excision operation time was 48.6 minutes (range, 30–120 minutes), and the average incision length was 5.0 cm (range, 4–11 cm). The average blood loss during the operation was 34.7 mL (range, 5–100 mL). The average length of hospital stay for our patients was 2.5 days (range, 2–4 days).

Macroscopically, all of the patients had negative surgical margins. Neither intraoperative complications nor skin necrosis developed. One patient had a minor wound infection and was treated successfully with a course of oral antibiotics.

After a mean follow up of 92.9 months, one of the 37 patients (2.7%) complained of recurrence of symptoms and had confirmed local recurrence via MRI 12 months after the surgery. This patient underwent subsequent excision surgery following preoperative ultrasound-guided hookwire localization and had been symptom-free for 19 months before their last follow-up visit.

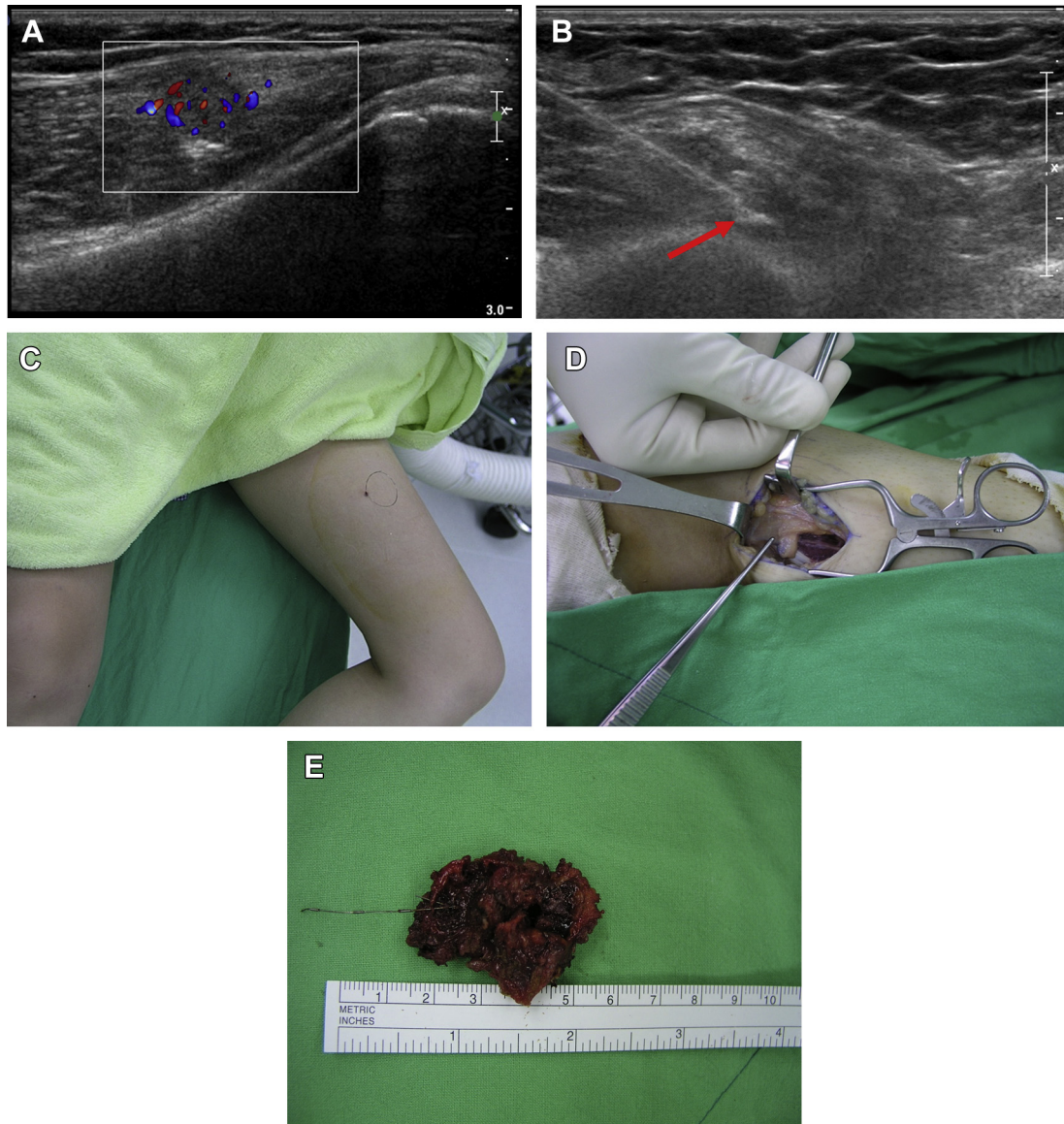


Fig. 1. (A) Ultrasonography of a 33-year-old female with left thigh intramuscular hemangioma (IMH); (B) after wire deployment, the wires' hooked tip (arrow) aids fixation of the wire in the IMH; (C) after hookwire localization; (D) soft tissue dissection following down the hookwire; (E) the specimen that was excised with the hook wire *in situ*.

There was one patient who still had mild pain after resection, but there was no evidence of recurrence after series image evaluation. The symptoms immediately subsided after pain-relief medications were administered.

4. Discussion

There are several reports on different options for treating IMH, including observation, corticosteroids, radiation, radium therapy, interstitial radium needles, interferon- α 2, topical agents (carbon dioxide snow), cryosurgery, arterial ligation, embolization by injection of a sclerosing agent, and surgical excision.^{4,7,18–22} Of these, surgical excision yields better effective results in outcomes with regard to pain relief and excellent function at long-term follow up.^{4,9} However, local recurrence rate is the most serious problem associated with

surgical treatments, with incidence reported between 18% and 61%.^{4,7–10} Bella et al¹⁰ reported on the observation of 110 cases with IMH and a literature review concluded that surgical margin is the major determinant for local recurrence-free survivorship in patients with IMH.

Only one previous study used preoperative ultrasound-guided hookwire for localization in treating IMH. Excellent clinical results and the absence of recurrence were noted in all four cases examined. However, in that study, the wire was placed adjacent to but not through the tumor.⁵ In our study, we placed the preoperative ultrasound-guided hookwire directly through the tumor and then excised the tumor following down the guide wire in 37 patients with non-palpable IMH. We performed this procedure in order to achieve more precise localization, together with better cosmetic results and functional recovery. The average

incision length was 5 cm and the average length of time patients were admitted to hospital was only 2.5 days. The overall local recurrence rate was 2.7% (1 in 37 patients) in a mean follow up of 92.9 months, much lower than previously reported (18–61%).^{4,7–10}

We believe that hookwire localization under ultrasonography before surgical excision is a good method for localization. However, localization must be performed in lesions that have been correctly diagnosed. In this study, preoperative localization was performed after the diagnosis was established by an experienced radiologist (H.J. Chiou) according to typical imaging features on ultrasound and MRI.¹⁷ We strongly suggest that the procedure should be avoided for lesions with any diagnostic uncertainty.

Several disadvantages were reported for wire-guided localization for nonpalpable breast tumors: (1) wire placement is technically challenging, particularly in dense breast tissue; (2) the wire may become displaced, migrate, or be transected during mobilization of the patient^{23–26}; (3) the presence of a wire can result in a more complicated incision; and (4) the procedure can increase the infection rate.

In our study, the mean procedure time for localization was only 10.6 minutes. That might be because IMH is relatively soft and easier to identify using ultrasonography. Also, there was no displacement, migration, or transection of the hookwire in our patients. This might be due to the hooked tip of the wire being able to provide a more rigid fixation and the fact that the wound of localization over the limbs is more easily protected than that of the trunk. Additionally, there were no procedures related to neurovascular injury noted in our study. This may be because most IMHs were surrounded by muscle and located away from the neurovascular bundle. The average operative wound was 5 cm long and only one superficial wound infection was noted in our patients.

There are some limitations of our study. First, this was a retrospective study. Second, we did not classify the histological type of IMH in this study. However, the inferences in recurrence rate from the vessel type are still under debate. There are only a few studies reporting on whether vessel type may be one of the risk factors of local recurrence, in which the difference in recurrence rate was not statistically assessed.^{4,7} Third, our mean follow up was 92.9 months. In a previous report, late recurrences were found to occur relatively frequently with IMH.¹⁰ In addition, we determined local recurrence via MRI, which was only arranged when patients complained of symptom recurrence or had positive findings during detailed palpation. Thus, the recurrence rate may be underestimated in our study.

In conclusion, hookwire localization under ultrasonography before surgical excision for IMH had lower local recurrence rates. We believe that, through accurate localization, this method can help surgeons excise the IMH via a smaller surgical wound and avoid additional soft tissue and muscular injury, thus providing a better cosmetic result and functional recovery.

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