ABSTRACT

**Purpose.** To evaluate the efficacy of a musculoskeletal oncology training module during residency.

**Methods.** 24 orthopaedic residents with differing years of experience were recruited. 12 of them received musculoskeletal oncology training for 6 months. The remaining 12 were controls who did not attend the training and had no clinical experience in a musculoskeletal oncology unit but had at least 3 years of postgraduate surgical training. Upon completion, residents in both groups were assessed by a knowledge test and then an objective structured clinical examination (OSCE).

**Results.** Residents who attended the training module had better mean knowledge test scores (48 vs 25 out of 58, p<0.0001) and OSCE scores (32 vs 22 out of 42, p<0.004), compared to those who did not attend. No residents who attended the training module marked an inappropriate biopsy site that would have compromised definitive surgery, compared to 5 (42%) of the untrained residents who marked an inappropriate biopsy site that may have resulted in an unnecessary amputation. All residents who attended the training module agreed that such a module should be included in the orthopaedic residency programme.

**Conclusion.** Residents who attended the training module were more aware of the biopsy principles and risks. A training module for musculoskeletal oncology should be included in the orthopaedic residency programme.

**Key words:** biopsy; internship and residency; oncology service, hospital; orthopedics

INTRODUCTION

Primary malignant bone and soft-tissue tumours are rare and account for about 1% of all malignancies. They occurce with age and often gives rise to non-specific symptoms. Most soft-tissue tumours occur in the lower limbs, and are usually treated with a limb salvage procedure. Adequate preoperative evaluation is necessary prior to definitive treatment in order to achieve a good prognosis.
Biopsy is essential for histological classification of the grading and staging of tumors, and should be performed as a definitive procedure. Tumor margins and limb function may be compromised when the biopsy is poorly performed. Complication rates are higher if the biopsy is performed by a referring physician. As a result of an inadequate biopsy, >18% of patients had their treatment altered, whereas >4% of patients underwent an unnecessary amputation. The rate of missed or mis-diagnosis is higher after soft-tissue than bone biopsies. Morbidity after inappropriate intervention for benign tumors is also a concern.

Musculoskeletal oncology training is essential for all orthopaedic trainees, regardless of subspecialty. We evaluated the efficacy of a musculoskeletal oncology training module during residency.

MATERIALS AND METHODS

Between January 2010 and June 2010, 24 orthopaedic residents with differing years of experience were recruited. 12 of them received musculoskeletal oncology training for 6 months by 3 consultants and one radiologist in our hospital. The remaining 12 were controls (randomly selected from other hospitals) who did not attend the training and had no clinical experience in a musculoskeletal oncology unit but had at least 3 years of postgraduate surgical training. This study was approved by the institutional review board of our hospital.

The trainees attended one-hour, case-based sessions weekly. The history, preoperative investigation, excision planning, and adjuvant therapy of each of the cases were discussed. The principles of appropriate imaging and biopsy in establishing a definitive diagnosis were emphasised. Operative exposure was also provided. Upon completion, residents in both groups were assessed by 2 consultants using a knowledge test and then an objective structured clinical examination (OSCE).

The knowledge test (full mark, 58) was for assessment of knowledge of 4 common lesions: osteochondroma, osteogenic sarcoma, giant cell tumour, and malignant soft-tissue tumor (liposarcoma) [Figs. 1 and 2]. A short medical history, imaging, and a histology slide for each case were provided.

The objective structured clinical examination (full mark, 42) was for assessment of biopsy principles using a prosthetic lower limb with a palpable mass in the medial thigh region. The case history of a 45-year woman with a suspected malignant soft-tissue lesion in her left medial thigh was provided. Trainees were asked to mark the biopsy site and incision (if appropriate) on the prosthetic limb.

Figure 1 (a) An osteochondroma in the proximal tibia, (b) an osteogenic sarcoma of the femur, (c) a giant cell tumour of the proximal fibula, and (d) a liposarcoma in the mid-thigh.

Figure 2 A histology slide showing pre-dominance of plasma cells in multiple myeloma.
Biopsy sites were categorised as: class 0 (optimal), class I (sub-optimal but can be easily incorporated at the time of definitive surgery), class II (markedly deviated), and class III (cannot be incorporated into the incision during definitive surgery). The optimal site should be longitudinal and in the plane of the incision for definitive surgery and should not expose neurovascular structures.

Residents in both groups were asked to provide feedback on whether such a training module should be implemented. Unpaired groups were compared using Student’s t tests. A p value of <0.05 was considered significant.

RESULTS

Residents who attended the training module had better mean knowledge test scores (48 vs 25 out of 58, p<0.0001) and OSCE scores (32 vs 22 out of 42, p<0.004), compared to those who did not attend (Table). The more experience the residents had, the less difference in the knowledge test score. No residents who attended the training module marked an inappropriate biopsy site that would have compromised definitive surgery (all were class 0 or I), compared to 5 (42%) of the untrained residents who marked an inappropriate biopsy site with a transverse incision (class II or III). This would have compromised a subsequent limb salvage procedure and may have resulted in an unnecessary amputation in 3 patients. All residents who attended the training module agreed that such a module should be included in the orthopaedic residency programme.

DISCUSSION

Orthopaedic residents should understand the role of biopsy in musculoskeletal oncological management. In our study, 42% of residents who did not attend the training module failed in the OSCE (biopsy test) and would have compromised the definitive surgery. The biopsy may alter the appearance of the tumour and surrounding tissues, making imaging studies suboptimal. It is important to obtain a representative sample of tumour tissue for histological analysis.

The amount of tissue collected varies between incisional (fine needle aspiration, trocar needle biopsy, open biopsy) and excisional biopsies. Incisional biopsy is recommended for malignant musculoskeletal tumours. Open biopsy should be performed by the surgeon responsible for the definitive procedure, because of higher diagnostic and accuracy rates.

In current regional orthopaedic training schemes, training in a musculoskeletal oncology unit is not compulsory. This subspecialty is examined in the written examinations of the United Kingdom In-Training Examination and Fellowship of the Royal College of Surgeons, but competence in clinical settings is not always evaluated. Residents who attended the training module were safer, more competent, and more aware of the biopsy principles and risks.

One of the limitations of this study was the small sample size. Evaluation of the trainees at a later period (after an interval of several months) after completing the training module is preferable.

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REFERENCES