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BRIEF REPORT

Circumferential scouting punch biopsies to delineate surgical margin for dermatofibrosarcoma protuberans

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ABSTRACT

Dermatofibrosarcoma protuberans (DFSP) is an uncommon soft-tissue tumor involving the dermis and subcutaneous tissue with a high local recurrence rate after standard excision. Mohs micrographic surgery offers a lower recurrence rate. However, the procedure requires multiple stages of excision with intra-operative histopathological mapping, which is time consuming and expensive. We report our experience of using circumferential scouting punch biopsy technique in five patients to determine in advance the resection margins for DFSP prior to wide excision. Multiple 4 mm punches, usually eight in number, were performed 1–2.5 cm around the palpable borders of DFSP to delineate the resection margins in five consecutive patients. Tumors were excised at a later date along the margin defined by these biopsies and the wounds were repaired with skin graft. The operation was completed in 2 hours in all cases excluding one that required frozen sections for deep margin. No recurrence was noted 2–10 years after the operations. The results suggest that circumferential scouting punch biopsies before wide excision may be an alternative method to define the resection margins for DFSP when Mohs surgery is not available.

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Introduction

Dermatofibrosarcoma protuberans (DFSP) is an uncommon cutaneous soft tissue tumor of intermediate malignancy.¹ It is characterized by progressive local growth and a propensity for local recurrence, but rarely metastasizes. Surgical excision can be challenging due to the invasive nature that results in high local recurrence rates.² Recurrence rates of DFSP range from 30% to 60% with surgical margins less than 3 cm, but reduce to a mean of 18% with resection margins greater than 3 cm.³ However, wide margins may be difficult to obtain for lesions on the head and neck due to potential tissue loss equals loss of critical structures. Mohs surgery is a technique of controlled skin cancer removal by mapping and serial frozen sections of resection margins. Each stage of tissue removal and microscopic examination is repeated until all margins are clear of cancer.^{4–6} Removal of DFSP by Mohs surgery provides maximal

tissue conservation with a lower recurrence rate (0–6%).^{3–6} However, Mohs surgeons are not available in many medical facilities. Moreover, it may require several hours to complete a large resection by Mohs surgery.^{7,8} Longer operation time may increase medical expense.^{7,8}

Without Mohs surgeons in our region, we tried a different approach by performing multiple punch biopsies around the tumor in the clinics to determine the resection margins first and then performed wide excision at a later date. We treated five consecutive DFSP patients with this approach.

Patients and methods

During a 10-year period (1999–2009), five patients with DFSP (Table 1) underwent circumferential punch biopsies in the clinic several days before wide excision. We first outlined the tumor border by palpation, and then performed multiple 4 mm punches, usually eight in number, at a distance 1–2.5 cm around the palpable border. For the tumor located near the nipple, two to three rows of punches were carried out in order to preserve more normal areolar tissue. The punch specimens were processed for routine histopathology examination. The whole tumor was then excised in a few days in the

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Table 1 Demographic data of 5 patients with dermatofibrosarcoma protuberans.

Patient/Sex/Age	Location	Size	Numbers of punch	Resection margin to tumor: shortest distance/longest distance	Operation time	Outcome
1/F/34	Right upper chest near axilla	7.3cm × 6.2 cm	8	2 cm/2 cm	2 hours 5 minutes	No recurrence at 10 years
2/M/37	Left thigh	4.5cm × 3cm	8	2 cm/2 cm	1 hour 50 minutes	No recurrence at 9 years
3/F/30	Right breast	2.8cm × 1.5 cm	17	1 cm/2 cm	30 minutes	No recurrence at 9 years
4/F/22	Right breast	3.5cm × 4.2 cm	8	1.2 cm/2 cm	2 hours 4 minutes	No recurrence at 3 years
5/M/48	Scalp	5.5cm × 4.5 cm	8	2.5 cm/2.5 cm	4 hours 28 minutes*	No recurrence at 2 years
Mean ± standard deviation Age: 34 ± 10		4.7 ± 1.8 cm × 3.9 ± 1.8 cm	10 ± 4	1.7 ± 0.6 cm/2.1 ± 0.2 cm	2 hours 11 minutes ± 1 hour 26 minutes	6.4 ± 3.6 years

* Including 2 hours waiting for frozen section results during operation.

operating room along the lines drawn by connecting the tumor-free dots determined by punch biopsy. Frozen sections were completed during operation to check the deep margin when necessary.

Patient 1 was an otherwise healthy 34-year-old woman who presented with a small scar-like nodule that had been enlarging slowly for 17 years on her right upper chest near the axilla (Figure 1A). Histopathologically, the tumor showed a diffuse, extensive proliferation of spindle cells throughout the dermis with invasion to the subcutaneous tissue (Figure 1B). The findings were consistent with DFSP. In this case, we tried photodynamic

diagnosis, a technique that utilizes the preferential accumulation of photosensitizer in tumor cells with a 6-hour occlusion of 2% 5-aminolevulinic acid (Merck, Darmstadt, Germany) to define the tumor margin.⁹ It was based on the fact that tumor cells tend to accumulate more protoporphyrin IX, the active metabolic product of 5-aminolevulinic acid, and emits red fluorescence under Wood's light excitation.¹⁰ However, no visible fluorescence was detected. The negative results might be attributed to insufficient trans-epidermal delivery of photosensitizer through an intact stratum corneum¹⁰ or the deep location of the tumor. Eight circumferential

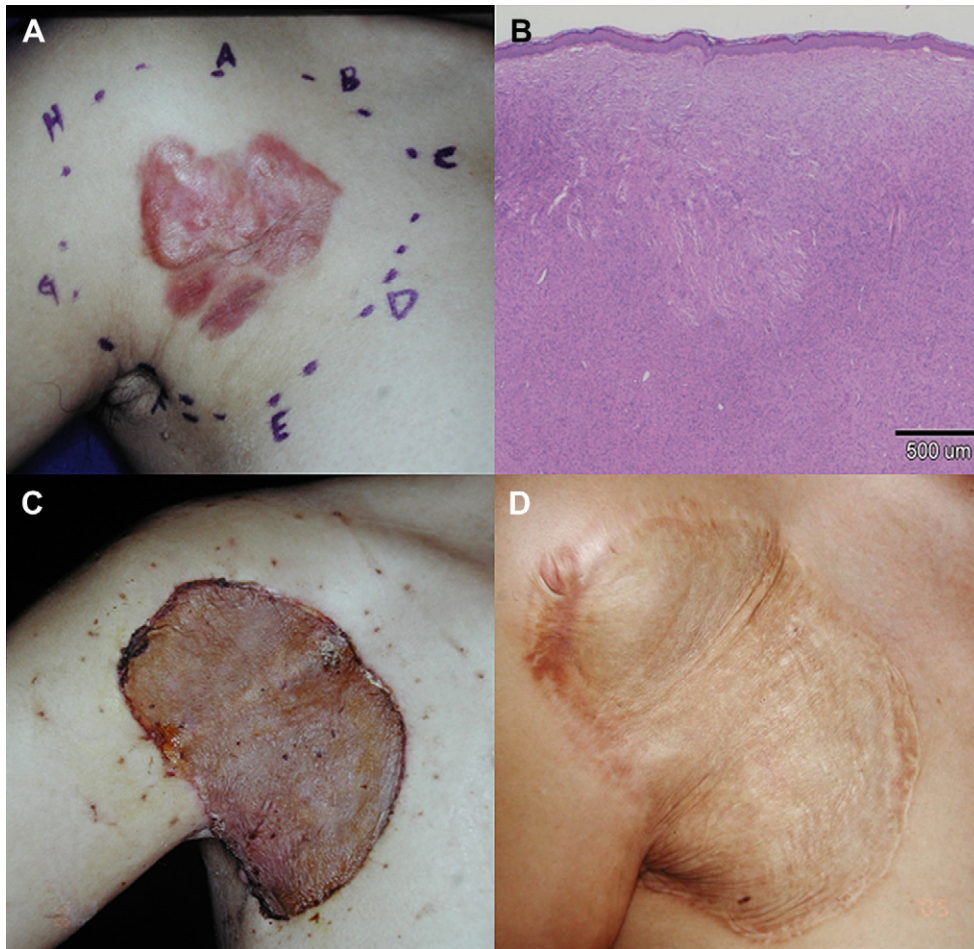


Figure 1 (A) A 7.3 cm × 6.2 cm tumor presented on right upper chest near axilla in Patient 1. The surgical margin was defined by eight punch biopsies (marked as A to H on skin) 2 cm beyond the tumor. (B) Histopathologic examination revealed extensive proliferation of spindle cells throughout the dermis and the subcutaneous tissue. The spindle cells were monomorphous with relatively uniform, elongated or S-shaped nuclei and had a tendency to arrange in a radiating storiform pattern. The findings were consistent with dermatofibrosarcoma protuberans. (C) The skin defect was repaired with skin graft. (D) One week after operation. No tumor recurrence was noted 10 years after operation.

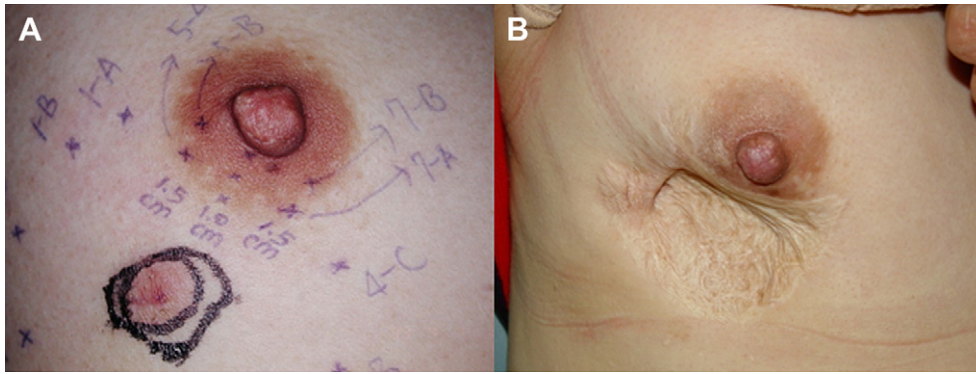


Figure 2 (A) Patient 3 had a 2.8 cm × 1.5 cm reddish nodule on her right breast. In order to preserve the areola, the areola margin was delineated with three rows of 4-mm punch biopsies prior to excision: the first row – one biopsy 1 cm from the tumor mass (marked as 1.0 cm on Figure A; the second row – three biopsies 1.5 cm from the tumor (labeled as 5A, 7A and the central biopsy not labeled on Figure A; the third row – three biopsies 2 cm from the tumor (labeled as 5B, 7B and the central biopsy was not labeled on Figure. (B) The other 10 biopsies were taken 2 cm beyond the palpable tumor margin in other directions. There was no tumor recurrence at 9 years follow-up.

4 mm punch biopsies were performed 2 cm beyond the palpable border of the mass (Figure 1C). Patient 2, a 37-year-old man, with a DFSP on his left thigh for 10 years was treated with same technique to delineate the tumor before excision (data not shown).

Patients 3 and 4 had pathology proven DFSP on the breast (Figures 2 and 3) where maximal preservation of breast tissue was desirable. In Patient 3, the tumor margin toward the nipple was delineated by performing a total of seven punch biopsies in three

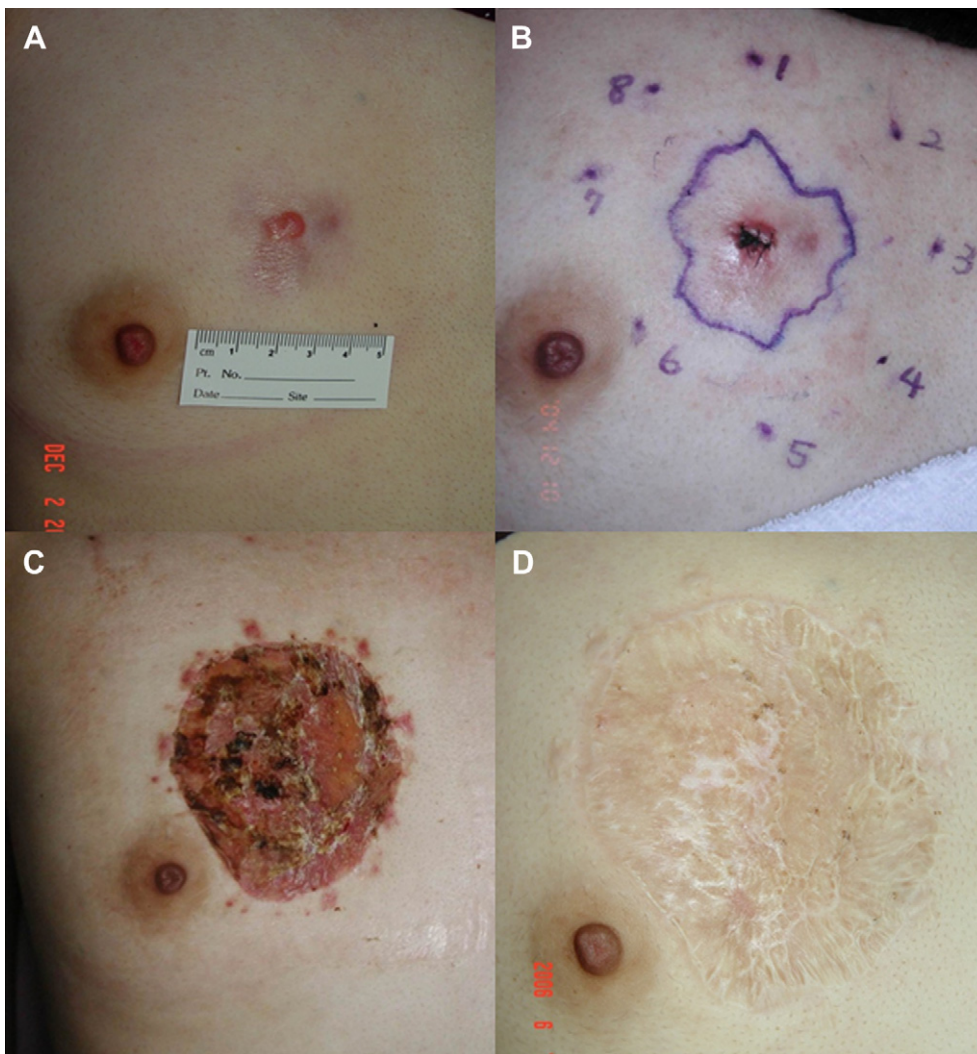


Figure 3 (A) A 22-year-old woman (Patient 4) presented with an irregular, infiltrated mass (3.5 cm × 4.2 cm) on her right breast. (B) Eight 4 mm punch biopsies were performed 2 cm beyond the palpable tumor margin with the areolar margin being only 1.2 cm (number 6, B). (C) One week after excision with skin graft in place. (D) There was no recurrence at 3 years follow-up.

rows (1 cm, 1.5 cm and 2 cm, respectively) from the tumor (Figure 2A). Additional 10 biopsies were taken 2 cm beyond the palpable tumor margin in other directions. In Patient 4, eight punch biopsies were performed 2 cm from the palpable border of the tumor except for the areola border where the punch was done 1.2 cm from the tumor (number 6, Figure 3B). Patient 5's DFSP was located on his scalp. There was no palpable lymphadenopathy in the neck, submental and postauricular areas. Computed tomography scan revealed no direct bony destruction from the scalp tumor. Eight punch biopsies were performed with 2.5 cm distance beyond the border of the palpable mass because tumor of this location was reported to be more invasive.¹¹

Results

All biopsy specimens were negative for tumor cells. The tumors were excised along the margin connected by these biopsies and to the depth of fascia except in Patient 5. Frozen section during operation confirmed that the lateral resection margins were free

of tumor but the horizontal sections of the tumor base showed tumor invasion into the deep subcutaneous fat. The underlying periosteum was removed. Skin defects were repaired with split thickness skin graft (STSG) in all patients. The total operation times ranged from 30 minutes to 4 hours 28 minutes (mean: 2 hours 11 minutes \pm 1 hour 26 minutes). The longest operation time was with Patient 5 where a frozen section was required which took 2 hours. No clinical recurrence was noted in all patients during 2 years to 10 years (mean: 6.4 \pm 3.6 years) of follow-up after operation.

Discussion

In this small case series, we demonstrated that peripheral resection margins of DFSP can be drawn in advance by multiple punch biopsies around the tumor before performing wide excision in the operating room. This procedure saved time and the expense of surgery, and the outcome appeared satisfactory. There is a concern that this scouting punch biopsy can only check a small fraction of

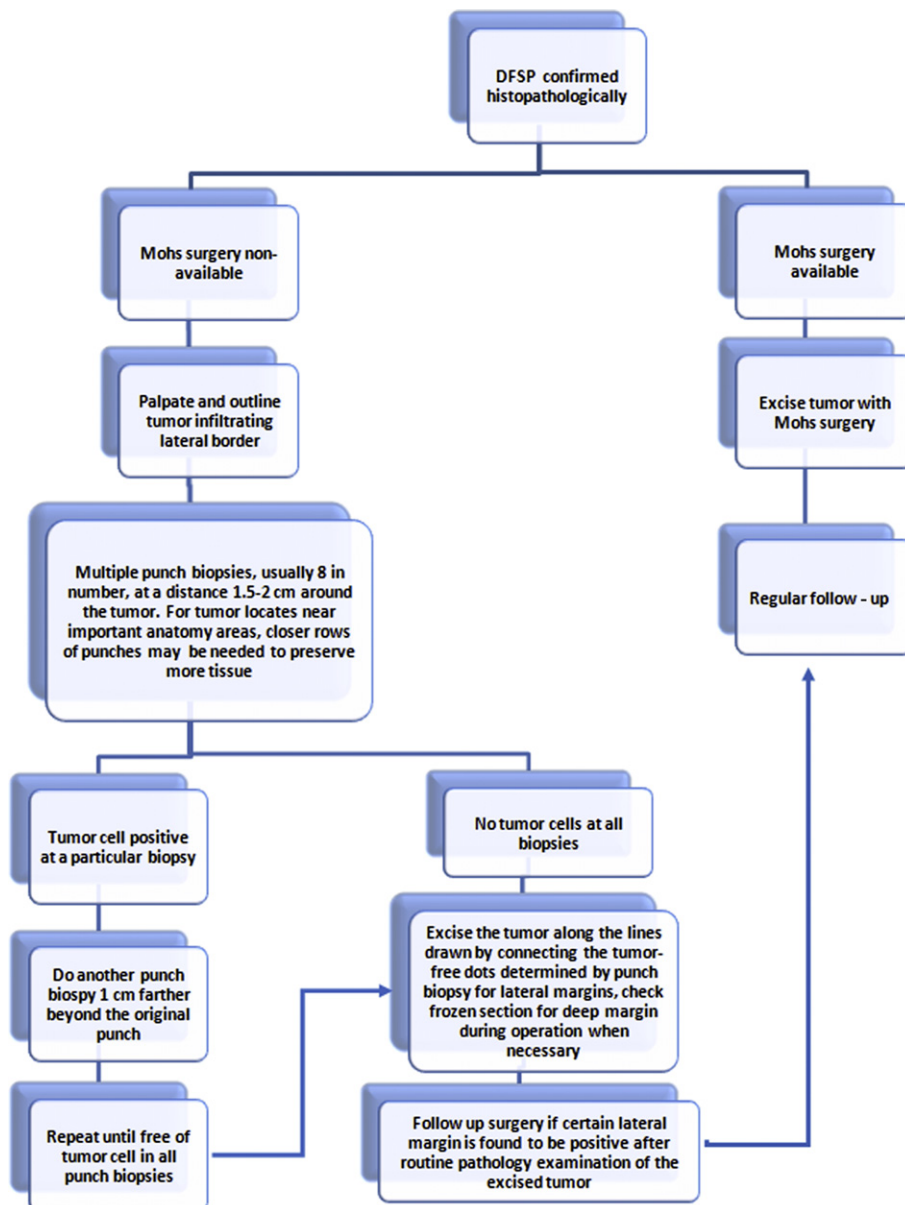


Figure 4 An algorithm shows the proposed approach of surgical intervention of dermatofibrosarcoma protuberans (DFSP).

the lateral margins and does not check the deep margin. However, the purpose of using this scouting biopsy technique is to find a reasonable estimation of resection margins so that maximal tissue preservation can be achieved when Mohs surgery is not available. With this approach, the resection margins of the excised tumor can then be checked by routine histopathological study. If necessary, additional tissue may be excised in a follow-up surgery. Clearly, this scouting punch biopsy technique does not check the deep margin of DFSP, which can be determined by frozen section during surgery when necessary after the tumor has been removed by wide excision. Confirmation of free deep margin is critical in tumors that are associated with increased risk of local recurrence in specific locations, such as the scalp, due to higher incidence of deep tissue involvement.¹¹ This is exemplified in the scalp tumor in Patient 5.

Appert et al reported that multiple scouting biopsies before Mohs micrographic surgery has been used in extramammary Paget's disease to define the peripheral surgical margin.¹² In extramammary Paget's disease, the tumor infiltration at the periphery primarily involves the epidermis. This is in contrast to DFSP where the tumor infiltrates the dermis and subcutaneous tissue. The tumor cells in the infiltrating border of DFSP may be few in number and show little dysplastic changes, thus may be difficult to be differentiated from normal dermal fibroblasts in hematoxylin–eosin sections. Even with CD34 staining, it may be difficult to differentiate infiltrating tumor cells from the normal CD34-positive interstitial dendritic cells and cells around hair follicles and sweat glands in normal dermis.

For most of our patients, eight punches were sufficient for delineation of lateral resection margin and the surgery had been shortened to approximately 2 hours. The surgery time for Patient 5 was 4.5 hours because of the extra time required for an intra-operative frozen section to evaluate the deep resection margin and the removal of the underlying periosteum.

In DFSP, initial adequate excision is critical because metastasis is invariably preceded by two or more local recurrences.³ Insidious spread of a tumor into the clinically normal appearing skin around the tumor is not uncommon.¹³ Most surgeons suggested that a margin of at least 3 cm around the tumor with tissue down to the fascia should be removed to minimize the risk of recurrence.⁴ Even with such wide excisions, recurrence rates from 11% to 20% have been reported.⁴ The closest margin in our case was 1 cm and no recurrence has been noted 2–10 years postoperatively (mean 6.4 ± 3.6 years). It is possible that the favorable outcome in our patients might be because of the tumors had less infiltrative borders. More case studies are needed before a definite conclusion

can be made. A proposed approach of surgical intervention of this tumor is shown in Figure 4.

In summary, we reported five patients with DFSP successfully treated with surgical excision in which the lateral resection margin was predetermined before excision by scouting punch biopsy technique in the outpatient clinics. The patients remained tumor free from 2 years to 10 years after tumor excision. The results suggest the lateral resection margins of DFSP can be determined by this type circumferential scouting punch biopsy technique in selected tumors when maximal normal skin preservation is highly desirable and Mohs surgery is unavailable. However, studies of more cases are needed to evaluate the value of this approach.

References

1. Gloster Jr HM. Dermatofibrosarcoma protuberans. *J Am Acad Dermatol* 1996;**35**:355–74.
2. Arnaud EJ, Perrault M, Revol M, Servant JM, Banzet P. Surgical treatment of dermatofibrosarcoma protuberans. *Plast Reconstr Surg* 1997;**100**:884–95.
3. Nelson RA, Arlette JP. Mohs micrographic surgery and dermatofibrosarcoma protuberans: a multidisciplinary approach in 44 patients. *Ann Plast Surg* 2008;**60**:667–72.
4. Ratner D, Thomas CO, Johnson TM, et al. Mohs micrographic surgery for the treatment of dermatofibrosarcoma protuberans. Results of a multiinstitutional series with an analysis of the extent of microscopic spread. *J Am Acad Dermatol* 1997;**37**:600–13.
5. Gloster Jr HM, Harris KR, Roenigk RK. A comparison between Mohs micrographic surgery and wide surgical excision for the treatment of dermatofibrosarcoma protuberans. *J Am Acad Dermatol* 1996;**35**:82–7.
6. Snow SN, Gordon EM, Larson PO, Bagheri MM, Bentz ML, Sable DB. Dermatofibrosarcoma protuberans: a report on 29 patients treated by Mohs micrographic surgery with long-term follow-up and review of the literature. *Cancer* 2004;**101**:28–38.
7. Smeets NW, Krekels GA, Ostertag JU, et al. Surgical excision vs Mohs' micrographic surgery for basal-cell carcinoma of the face: randomised controlled trial. *Lancet* 2004;**364**:1766–72.
8. Essers BA, Dirksen CD, Nieman FH, et al. Cost-effectiveness of Mohs micrographic surgery vs surgical excision for basal cell carcinoma of the face. *Arch Dermatol* 2006;**142**:187–94.
9. Becker-Wegerich PM, Fritsch C, Schulte KW, et al. Carbon dioxide laser treatment of extramammary Paget's disease guided by photodynamic diagnosis. *Br J Dermatol* 1998;**138**:169–72.
10. Wong TW, Sheu HM, Lee JY, Fletcher RJ. Photodynamic therapy for Bowen's disease (squamous cell carcinoma in situ) of the digit. *Dermatol Surg* 2001;**27**:452–6.
11. Loss L, Zeitouni NC. Management of scalp dermatofibrosarcoma protuberans. *Dermatol Surg* 2005;**31**:1428–33.
12. Appert DL, Otley CC, Phillips PK, Roenigk RK. Role of multiple scouting biopsies before Mohs micrographic surgery for extramammary Paget's disease. *Dermatol Surg* 2005;**31**:1417–22.
13. Sondak VK, Cimmino VM, Lowe LM, Dubay DA, Johnson TM. Dermatofibrosarcoma protuberans: what is the best surgical approach? *Surg Oncol* 1999;**8**:183–9.