Dermoscope-guided laser excision of a pilomatricoma – a novel surgical procedure performed in primary care settings

Running head: Dermoscope-guided surgeries

ABSTRACT

Aim: Our aim was to report a novel procedure – dermoscope-guided laser excision.

Case presentation: A male patient aged 63 years presented with a non-painful mass behind his left pinna. Dermoscopy with cross-polarisation revealed several signs of malignancies, including a sticky surface, asymmetries of patterns and colours, structureless regions, white lines, and polymorphous blood vessels. Other difficulties were that the locality was concave, and that the high perfusion rendered haemostasis difficult.

A second dermoscope with a small receiving probe guided us to mark the excisional margins precisely. The scope was then fixed with the probe down above the lesion. Signals were channelled from the scope to a computer and then to a monitor. The extent of magnification was controlled by altering the distance between the dermoscope and the surgical field.

The laser was set to a cutting mode, which also contributed to partial haemostasis. Incisions were made by following the pre-set margins. After one incision, the mass was still attached to the adjacent tissues. The dermoscope was applied to assure that the incision conformed to the pre-set lines. Deeper incisions were performed, then back to the dermoscope. Upon three laser/dermoscope cycles, the mass separated *on its own*. Minor bleeders were sealed with the laser set to a coagulating mode.

Results: The histopathological diagnosis was a pilomatrixoma. Healing was uneventful, with scarring being minimal. There was no relapse one year post-operatively.

Conclusions: Dermoscopy-guided laser excision delivered favourable clinical and cosmetic outcomes. Such procedure was feasible to be performed in primary care settings.

(Word count of abstract: 250)

Keywords: Carbon dioxide laser, cosmetic outcomes, excisional biopsy, laser ablation, office procedures, pyogenic granuloma

Introduction

We have previously reported dermoscope-guided (DG) punch biopsy (1), DG excisional biopsy (2), DG suturing (3), DG laser ablation (4), and DG cautery (5). We also reported the first case-control study on the outcomes of DG surgical procedures (DGSP) (6).

We report here the first DG laser excision for a cutaneous mass in an area with high vascular perfusion.

Presentation of the surgical procedure

A male patient aged 63 years attended us for a non-painful mass behind the left pinna noted two-months ago. Contact bleeding occurred on three occasions. Apart from mild allergic rhinosinusitis, his past health was unremarkable. There was no reliable history of trauma to that region. He had not been exposed to cold environments.

Physical examination revealed a non-tender, solitary, firm, and semi-peduncular nodule at the posterior crease of the left pinna, at the level of the tragus (Figure 1). The largest diameter was 0.9 cm. Erythema was prominent. A solid black *cap* was present at the most exterior part. The lesion was sticky. However, no erosion and no ulceration were noted macroscopically. The perilesional skin was normal in colour and texture. No abnormality was noted on both pinnae otherwise. There was no cervical lymphadenopathy.

We applied a dermoscope (Dermoscope A) which delivered high-quality images. Dermoscopy under cross-polarisation (Figure 2) revealed bits of differently coloured cloth fibres, substantiating stickiness of the surface of the lesion. The lesion was asymmetric in pattern and in colour.

A big ulcer was seen. However, such was due to the flat surface of the receiving probe of Dermoscope A compressing the lesion for focus during examination. The darkened cap was compatible with blood clots and early necrosis. Apart from the cap, the body proper was multi-coloured. Around 20% of the lesion was in a bluish hue. These regions were also structureless. However, such regions fell short of 25% of the entire area of the lesion. White lines were seen together with polymorphic blood vessels. Whether such vessels were serpentine and whether such crossed the centre of the lesion was difficult to define.

Our provisional diagnosis was pyogenic granuloma. Differential diagnoses including haematoma, deformed haemangioma, and one of the many benign hamartomas were highly unlikely. However, cutaneous malignancies could not be excluded.

We planned for excisional biopsy with 4 mm margins. Several difficulties presented themselves. Firstly, the lesion was on a concave surface, rendering marking of the surgical margin difficult. Secondly, the three-dimensional shape of the lesion might not be clearly perceived by the clinician. Thirdly, the pinna is a heavily perfused projection. It would be a challenge to achieve haemostasis.

We therefore planned for a novel procedure, which we termed “dermoscope-guided laser excision”. We spent much time discussing the advantages and limitations of this new procedure with the patient, and then attained his written consent.

We elected another type of dermoscope (Dermoscope B) which had two advantages. Firstly, the receiving probe of this dermoscope was small, and could be inserted into concave regions. We thus marked the incisional margins precisely.

Secondly, this scope could attain focus whether its receiving probe was touching the lesion or not. We thus fixed this dermoscope by clamps to a sturdy steel stand, with the receiver of the scope heading down vertically around 2 cm above the surgical field. We then connected the dermoscope to a desk-top computer, which outputted the visual signals to a monitor.

We set the laser to a gentle-cutting mode. We lifted the lesion with a tight pair of forceps, and lased precisely along the incision margins as marked. The cutting edges were made to be perpendicular to the surface. The laser beams allowed for some extent of haemostasis along the excisional route. Once we had completed one circle, the lesion was still attached to the adjacent tissues. We applied dermoscopy to assure that the incising margins were closely matching the marked margins. Laser was then re-applied. After three “laser-dermoscope cycles”, the lesion separated *by itself*, with clear margins. We then set the laser to a coagulating mode, and achieved complete haemostasis.

Wound healing was uneventful. The histopathological report came back to be compatible with a pilomatrixoma, and that complete excision with clear margins was attained. There was minimal scarring three months after the procedure (Figure 3). There was no relapse one year after the procedure.

Discussion

The advantages of dermoscopes in the early detection and diagnoses of skin cancers are well substantiated. Beyond tumours, dermoscopy has been reported to be applicable in the diagnoses of common inflammatory skin diseases (7, 8), vascular diseases (9-11), and infectious diseases (12-14). The realm of dermoscopy extends to diseases of the skin appendages (15, 16). Our team was fortunate enough to discover several novel applications for dermoscopy (17-21).

In 2015, one of us (AC) performed the first dermoscope-guided surgical procedure (DGSP). He then discussed this new surgical approach with another one of us (VZ) and other esteemed colleagues. It was found that in his primary care setting, DGSP led to statistical and clinical outcomes – in terms of incomplete excisions or relapse and obvious scarring – as compared to procedures without DG (6).

Different models of dermoscopes contributed in differing roles in this procedure. While Dermoscope A together with a single-lens reflex camera body provided clear images with high resolutions with and without cross-polarisation, Dermoscope B demonstrated its versatility all through the operation. Firstly, it allowed us to mark

incisional lines for a lesion in the skin crease owing to its small receiving probe. Secondly, we could adjust the magnification by altering the height of the probe above the surgical field. Thirdly, we could adjust the depth of the lesion and the surrounding tissues to be visualised via changing the extent of cross-polarisation. Fourthly, we applied it to assure that the incisions were where such should be in dermoscopy-laser cycles. Lastly, it minimised the extent of bleeding through fast and precise surgical manoeuvres planned pre-operatively.

As we previously presented, for clinicians with experience in dermoscopy and with structured training in skin surgery, performing DGSP should not be difficult (1-3). It takes some time to operate with your hands while watching the monitor. For superficial lesions, the scope could just focus on the surface of the lesions, that is, with no cross-polarisation. For thick lesions or those with complicated patterns, the extent of cross-polarisation could be adjusted catering for different surgical manoeuvres. As we previously depictured, the clinician can even set focus on the mucosal surfaces during DG-suturing adjacent to the eye and the nasolacrimal duct (3).

The costs of hardwares for DGSP is highly flexible. We have reported how we set up a dermoscopy-computer-monitor unit (4). We calculated thereof the total expenses being 2,200 USD. This should be well acceptable for a hospital or out-patient surgeries with several clinicians. Patients should be well-informed regarding the pros and cons of such novel procedures. They must be given an informed and free choice between conventional procedures and DGSP.

For clinicians contemplating DGSP, we suggested that such should be performed on adults in the early phases. Once having the procedures performed with virtuosity, operation on younger patients and for elderlies should be considered patient by patient. One of us (AC) has performed DGSP for a boy aged seven years (DG-excisional biopsy for a CD68+ and S100- juvenile xanthogranuloma) (2) and for a lady aged 89 years (DG-suturing for accidental wound) (3).

We thus urge other investigators to perform DGSP, provided that the hardwares, softwares, and the clinicians are up to the needs for this new genre of surgical procedures on the largest organ of the human body.

Conclusion

DG laser excision delivered good clinical and cosmetic outcomes for our patient. Such procedure was feasible to be performed in a primary care setting.

Figure captions

Figure 1 A non-tender, solitary, firm, and semi-peduncular nodule at the posterior crease of the left pinna. The largest diameter was 0.9 cm. Erythema was prominent. A solid black *cap* was present at the most exterior part. These features led us to adopt pyogenic granuloma as the provisional diagnosis

Figure 2 Dermoscopy with cross-polarisation revealed bits of differently coloured cloth fibres, substantiating stickiness of the surface of the lesion. The lesion was asymmetric in pattern and in colour. The ulcer seen was due to compression by the receiving probe of the dermoscope. Otherwise, focus would not be attained. The black cap was compatible with avascular necrosis. Significant dermoscopic signs for malignancies included bluish hue, structureless regions, white lines, and polymorphous vessels.

Figure 3 Minimal scarring three months after dermoscope-guided laser excision.

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Figure legends

Figure 1 A firm semi-peduncular skin mass was seen at the posterior crease of the left pinna, at the level of the tragus. A black cap was present at the most exterior part. No erosion and no ulcer were present.

Figure 2 Polarised dermoscopic image asymmetries in pattern and in colour. The cloth fibres indicated stickiness. The ulcer was formed when the focusing plain of the dermoscope was applied for compression. The presence of several significant clues – bluish hue, structureless areas (but smaller than 25% of the entire lesion), white lines, and polymorphous blood vessels – indicated that biopsy should be performed.

Figure 3 Minimal scarring was noted three months after the dermoscope-guided laser excision.

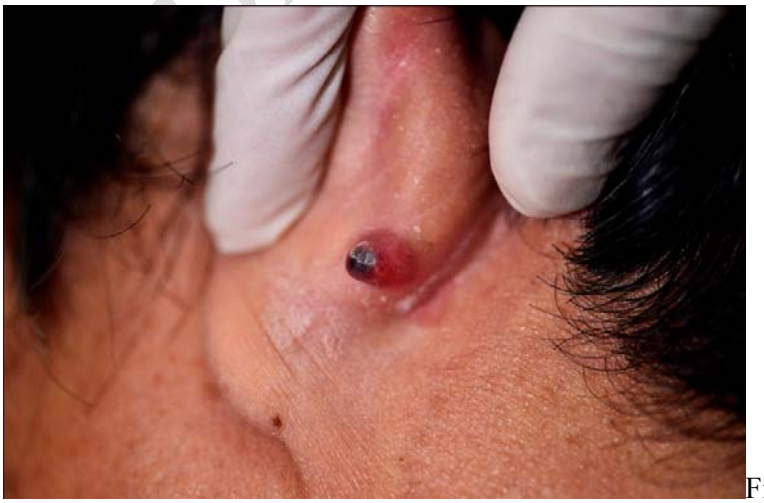

Figure 1

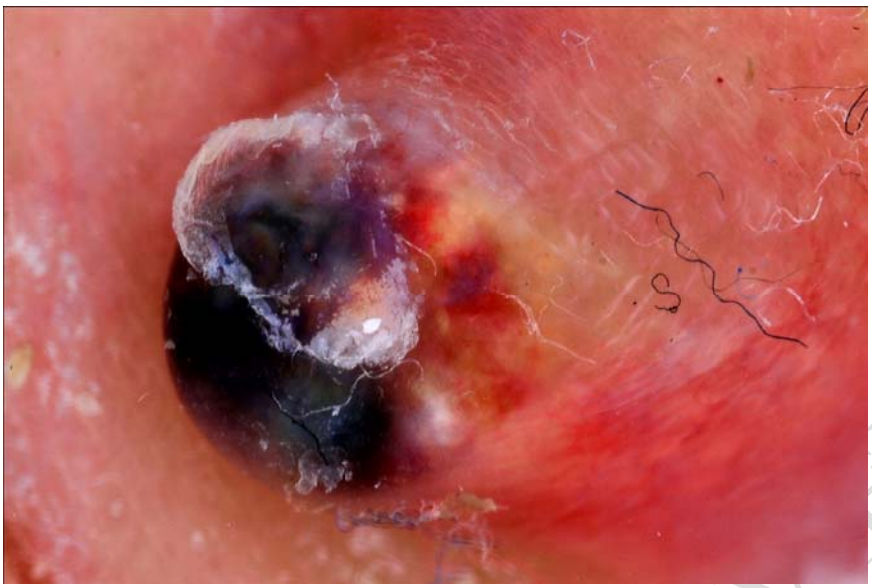

Figure 2

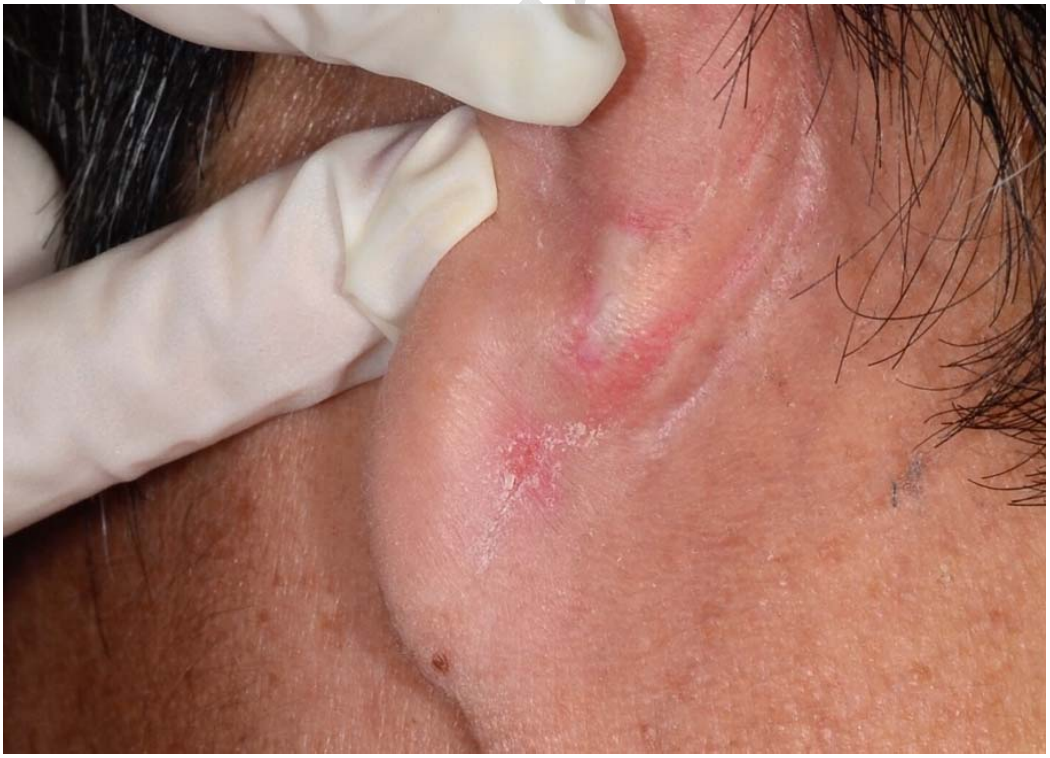

Figure 3