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## Abstract

Nonmelanoma (NMSC) are the most common skin cancer in the Western world. Basal cell carcinoma (BCC) account for roughly 80 % of NMSC. BCC are slow growing and rarely aggressive. A variety of treatments exist for the treatment of BCC with conventional surgical excision being the most commonly use method. Other options include Mohs' surgery, curettage and electrodesiccation, laser therapies, radiotherapy and a number of topical treatments. Cryosurgery is a potentially under-utilised treatment option that offers the benefit of being less invasive. Cryotherapy is not recommended for lesions that are: morphoeic; have poorly defined margins; recurrent; on the eyelid, nasolabial fold or preauricular region; fixed to deeper structures; have a depth greater than 3 mm. Lesions greater than 2 cm in diameter can be treated segmentally. BCCs that are thick can be debulked with a curette prior to treatment. Common complications include pain, edema and blistering. When BCC lesions are selected carefully treatment outcomes are highly successful.

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## Keywords

Cryotherapy • Nonmelanoma skin cancer • Non-melanoma • Basal cell carcinoma • Segmental cryosurgery • Debulking

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## Introduction

Nonmelanoma skin cancer (NMSC) are the most common skin cancer in the fair-skin population [1]. Basal cell carcinomas (BCCs) are the most common NMSC. There are a variety of treatment options available for the management of BCC with surgical excision being the most commonly used method. Cryosurgery has been widely

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available for the treatment of BCCs for the last 20 years, and is a useful alternative to the traditional surgical methods of removal [2]. Cryosurgery has a comparable outcome to conventional surgical excision when lesions are carefully selected and the correct technique is used. It is a less invasive method of treatment with a lower side effect profile and it is well tolerated without anaesthesia.

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## Description of the Disease

BCCs are the most common malignant neoplasm found in human populations [1]. BCCs constitute roughly 80 % of all non-melanoma skin cancers [3]. The growths are derived from cells originating in the basal layer of the epidermis [1]. Skin directly exposed to sunlight is commonly affected, including skin on the eyelids, the inner canthus and behind the ear.

BCC tumors have a characteristic slow progression. The slow rate of enlargement is due to constant and frequent cell death, whereby dying neoplastic cells undergo shrinkage and necrosis [4]. Extensive cell death causes BCC tumors to be contained within the area of origin [5]. Current estimations indicate that 0.0028–0.1 % of BCCs metastasize [6–8]. Lesions infiltrate tissues with irregular finger-like outgrowths contiguous with the main tumor mass. The malignancy is locally invasive and causes significantly greater morbidity than mortality [8]. Local tissue destruction is the main morbidity that results from BCC and this can impact on the cosmetic appearance or the functional outcome of the location [9].

Nodular BCCs are the most common clinical subtype [10, 11]. Nodular BCCs present as translucent or slightly erythematous papules or nodules with a sharp contour, a smooth margin, and telangiectasia. They commonly occur in sun-exposed areas of the head and neck region. Pigmented BCCs are hyperpigmented nodular BCCs. These lesions exhibit increased melanisation and thus can resemble malignant melanomas. The pigmented BCC has histological features which are similar to the nodular form, but with additional melanin [12].

The superficial subtypes also occur commonly. BCCs of the superficial variety present as well-circumscribed flat lesions with a pearly border [5]. Often there is scaling and crusting. These lesions often occur on the trunk and can resemble eczema [11].

Infiltrative and morpheic BCCs are more aggressive variants and they are less common [13–15]. Morpheic BCCs may present as a depressed white macule or scariform lesion which has a poorly defined border. The morpheic variety of BCCs usually has an aggressive growth pattern. These aggressive variants may invade extensively prior to exhibiting any obvious clinical symptoms.

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## Therapeutic Alternatives

### Surgical Excision

Surgical excision is the most commonly used method of treating BCC. Complete specimens can be sent for histological examination and to assess the adequacy of excision. Primary excision is associated with a high rate of local control and complete excision has a high cure rate [16]. However, conventional surgical excision may not produce a cosmetically attractive outcome, particularly on the face.

### Mohs Micrographic Surgery

Another surgical technique that allows for greater histological control is Mohs micrographic surgery. This technique – a microscopically-controlled method of removing skin cancers – is considered the gold standard for treatment of NMSC [16]. It involves excision of the lesion and a surrounding margin of tissue [16]. The tissue is sent for histopathological examination and another excision is undertaken if there are remaining tumor cells [17]. This process is repeated until all of the remaining abnormal cells are removed. This treatment modality is associated with an increased certainty of tumor eradication compared with conventional excision. Traditionally, this surgical option is performed on NMSC lesions occurring on the face. The technique also

allows for preservation of non-affected skin and produces a better cosmetic outcome.

Unfortunately, the increasing cost of using Mohs micrographic surgery means that the procedure is usually limited to areas like the face where the cosmetic and functional outcome justifies the cost.

## Curettage and Electrodesiccation

Skin curettes are oval or fenestrated spoons with a sharp cutting edge, usually used combined with an electrosurgical modality [18]. In the treatment of NMSC, electrodesiccation is used by superficially destroying affected tissue [18]. This technique involves removing cancerous tissue with the curette followed by lightly applying an electrical current to the base to burn any remaining tumor cells. This modality is relatively cheap and easy to perform. The cure rate for primary BCCs treated with this technique has been reported at 92.3 % [19]. A study examining 150 curetted non melanoma skin cancers showed that 76 % left some residual tumor tissue at the surgical margins [20]. Risk of recurrence is much higher with this technique and this is not the treatment of choice for recurrent BCCs [21].

## Radiotherapy, Photodynamic, Topical and Laser Treatments

Treatments such as radiotherapy, or using radiation to treat abnormal cells, are reserved for BCCs that cannot be cured with surgical management. Often radiotherapy is used to complement surgical management [22]. Topical treatments like imiquimod (5 % concentration) that stimulate a cell-mediated immune response to cancer cells, have been approved for treatment of BCCs, with an 82 % clearance rate [23].

Photodynamic therapy (PDT) is a technique of using light to activate a photo-sensitizer applied to the skin, which causes formation of reactive oxygen species that destroy tumor-affected cells [24]. A study evaluating nodular BCC treatment using PDT in comparison with surgical excision demonstrated a 76 % clearance rate compared with 96 % respectively [25].

Prior to the introduction of PDT, laser therapies were used. The CO2 laser in particular, was found to be effective using between two and four passes of the laser. These findings were reported in a number of individual case reports and case series [26–28]. Since the introduction of PDT, the use of lasers has become relatively infrequent.

## Cryosurgery

Cryosurgery is a method that involves tumor cell destruction by freezing the affected area with vaporizing liquid nitrogen [29]. Tumor cells are sensitive to cryosurgery because of their high water content and high metabolism [30]. Ice forms both extra- and intracellularly. Intracellular ice crystals expand and burst from inside the cell.

Like curettage, cryotherapy is simple and inexpensive; however, it does not allow for tumor margins to be examined under the microscope.

Table 130.1 outlines features to consider when selecting lesions for cryosurgery.

## Methodology

### Instruments Required

Sterile gloves  
Hand-held cryotherapy unit with various size tips.  
Antiseptic agents  
Curette  
Gauze and bandage

**Table 130.1** Lesion selection

Favorable features	Unfavorable features
Well defined margins	Poorly defined margins
Diameter less than 2 cm	Diameter more than 2 cm
Depth less than 3 mm	Depth more than 3 mm
Mobile	Fixed to deeper structures
Primary lesions	Recurrent lesions
Superficial or nodular	Morpheic
Previous radiotherapy to site	Pigmented skin
Back/helix of ear	Ala nasi, eyelid, nasolabial fold, scalp, preauricular region

Based on data from Ref. [2]

## Treatment of Lesions Less Than 2 cm

BCC lesions should have a clearly defined margins. Lesions that do not have a clear border or those that are recurring should be treated using surgical excision. The canister should be full so that the flow of liquid nitrogen is even. For this method the 'B' tip should be used.

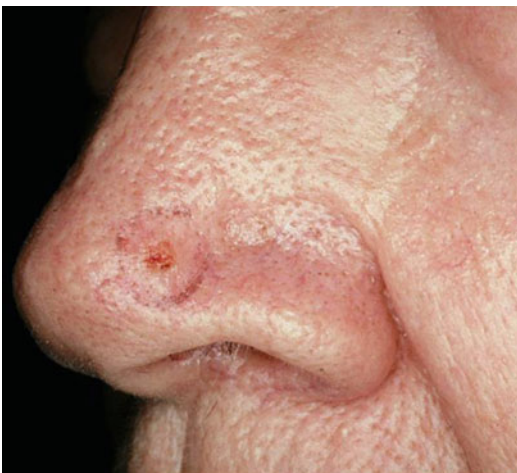
1. The lesion and an area of 0.5–0.75 cm of normal skin is clearly demarcated with a surgical pen (Fig. 130.1).
2. Hold the spray 1 cm away from the lesion at a 90° angle.
3. Spray the center of the lesion until ice forms over the lesion and spreads laterally to the margin (Fig. 130.2)
4. Maintain the field size of ice formation, at the marked margin, for a total 30 s. The time measured should begin from when ice first forms at the marked margin. At this stage the lesion should be frozen solid and firm on palpation.
5. The area is then thawed out for no less than 60 s. The lesion should be palpated until the lesion softens and the white appearance disappears.
6. Steps 2–4 are repeated.
7. The area is dressed with a potent steroid cream (used twice daily) to prevent inflammation. Oral prednisolone can also be used for 3 days

after cryosurgery to prevent post-cryosurgery morbidity. Figure 130.3 demonstrates the end result using this technique.

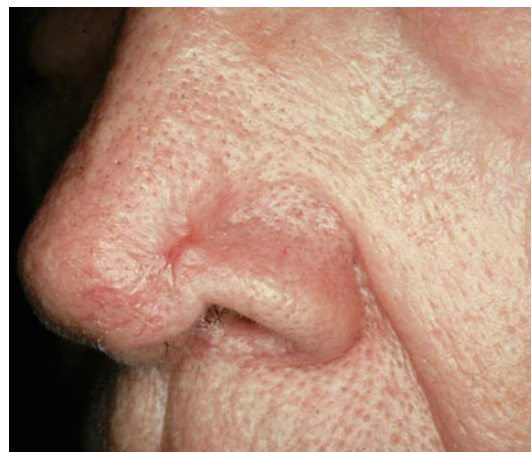
Single freeze-thaw cycle may be used, however there is some debate as to the success rate of this method [31]. A study comparing single and double freeze-thaw cycles demonstrated a 95.3 % cure rate of facial BCC when double freeze-thaw cycle was used compared to 79.4 % cure rate [31]. Effective tissue-destruction occurs with multiple freeze-thaw cycles.



**Fig. 130.2** Treatment of a basal carcinoma on the left side of the nose. The field size of ice formation should be held at the marked margin for 30 s (Courtesy of Gloria Graham, MD [45])



**Fig. 130.1** A basal cell carcinoma. An area of 0.5–0.75 cm should be marked around the lesion with surgical pen (Courtesy of Gloria Graham, MD [45])



**Fig. 130.3** Post-operative result of a basal cell carcinoma treated with cryotherapy. Note that there is very minimal scarring (Courtesy of Gloria Graham, MD [45])

## Treatment of Lesions That Are Irregular, Thick or Larger than 2 cm in Diameter

### Segmental Therapy

For lesions that are larger than 2 cm or those that are irregular a single spray to the center of the lesion will not be adequate, as the temperatures at the margins may not reach destructive temperatures. Segmental treatment can be used for these types of lesions:

1. Divide the lesion into multiple sections. Areas of no more than 2 cm are recommended so that the whole lesion can be frozen to a satisfactory temperature.
2. Each section is treated using the same methodology outlined for the treatment of lesions less than 2 cm. Each area is treated separately and the field of treatment may overlap.
3. Treatment may occur over two sessions, the second session may occur after 4 weeks
4. Alternatively a portion of the lesion can be treated in one session and remaining treatments treated in a second section. This may help to reduce the severity of the side effects that may occur.

### Debulking

Keratin is a poor conductor of cold and as a result thick BCC lesions do not reach satisfactory temperatures sufficient for tumor cell destruction. For BCCs which are large or thick a debulking procedure can be performed using a sharp curette. Recently a study examining 38 patients found that debulking BCCs with radio frequency prior to cryotherapy was also a useful method of debulking lesions, and provided the benefits of less bleeding, decreased procedure time and reduced use of surgical material. Currently, there is no literature comparing efficacy of the two debulking methods with each other [32].

## Complications

The most common side effect of cryosurgery is pain [2]. Usually pain occurs in most patients however the severity of pain can vary. In some

cases the pain can be so severe patients may have a syncopal episode. Edema and blistering is also a common occurrence. Symptoms are most severe around the eyelids, lips and genitals.

Hypopigmentation is also a common side effect. This loss of pigment is permanent. This side effect is not usually a problem for patients with fair skin. A feathering technique (light spray around the margin after treatment) can be used to disguise the contrast between the hypopigmented and normal skin.

## Success Rates

Cure rates are in the order of 92–96 % which is comparable to conventional surgical excision [2]. Recurrence rates have varied in the literature ranging from 0 to 8.2 % [33–43]. A recent study in 2003 examining 12 BCCs, smaller than 1 cm, located on the trunk and arms. The lesions were treated with a single freeze-thaw treatment and were excised and examined histologically. All of the lesions examined had no histologic evidence of the tumor after 1–2 months [43].

Cosmetic results have been shown to be better in conventional surgical treatment compared to cryotherapy [44]. One prospective randomized study compared the cosmetic results of BCC treated with cryosurgery and surgical excision. Cosmetic outcome was evaluated by the patient, a dermatologist, a dermatology nurse, a plastic surgeon and a beautician. The dermatologist, surgeon and nurse all felt that the excision yielded a significantly better cosmetic outcome. The patients felt that the excision produced a better cosmetic result, however the difference between the ratings for both treatments was small. Lastly, the beautician, who was unbiased, had no preference for either procedure.

## Conclusions

There are many treatment options available for the treatment of BCC, including surgical excision, Mohs micrographic surgery, curettage and electrodesiccation and lasers. Cryosurgery is one potentially under-utilised and less invasive option for the treatment of

BCC. It is easy to perform in an outpatient setting and offers the benefits of being a fast and cheap procedure to perform. Studies have shown that cryosurgery can be equally as effective as traditional surgical options when the correct technique is used and the lesions are carefully chosen.

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