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# The role of imaging in the management of patients with nonmelanoma skin cancer



## When is imaging necessary?

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### Learning objectives

After completing the learning activity, the learner should be able to describe high risk nonmelanoma skin cancers that may be locally invasive or metastatic and list clinical scenarios pertaining to skin cancer where CT, PET/CT, MRI, ultrasound, and lymphoscintigraphy imaging studies are indicated and appropriate for optimal patient care.

### Disclosures

#### Editors

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When treating aggressive skin cancers, pre- and postoperative imaging provides important information for treatment planning and multidisciplinary cooperation of care. It is important for dermatologists to recognize the clinical scenarios where imaging is indicated in the management of skin cancer. We here address the most common indications for imaging in cutaneous oncology and how to best utilize the modalities available. (J Am Acad Dermatol 2017;76:591-607.)

**Key words:** basal cell carcinoma; computed tomography; dermatofibrosarcoma; imaging; magnetic resonance imaging; Merkel cell carcinoma; perineural invasion; positron emission tomography; protuberans; radiology; skin cancer; squamous cell carcinoma; ultrasound.

## INTRODUCTION

While the vast majority of skin cancers can be effectively managed on the basis of clinical features alone, large or aggressive high-risk tumors or those that compromise vital anatomic structures may necessitate radiologic imaging for optimal management. In our experience, the nonmelanoma skin cancers (NMSCs) that most frequently require imaging include squamous cell carcinoma (SCC), basal cell carcinoma

(BCC), dermatofibrosarcoma protuberans (DFSP), and Merkel cell carcinoma (MCC).

SCC may be locally aggressive with the potential for lymph node involvement and distant metastasis. Imaging may be indicated for patients at high risk of SCC, for which criteria include recurrent tumors, tumors >2 cm in diameter or >2 mm in depth, poorly differentiated histology, perineural invasion (PNI), lymphovascular invasion, and

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*Abbreviations used:*

18-FDG:	18-fluoro-deoxyglucose
CDU:	color Doppler ultrasonography
CT:	computed tomography
FNAB:	fine-needle aspiration biopsy
FS:	fat saturation
GAD:	gadolinium
MRI:	magnetic resonance imaging
NMSC:	nonmelanoma skin cancer
NSF:	nephrogenic systemic fibrosis
PET CT:	positron emission tomography— computed tomography
PNI:	perineural invasion
PNS:	perineural spread
SUV:	standard uptake value
US:	ultrasonography

specific anatomic site (eg, the ears, lips, and anogenital regions).<sup>1-5</sup> Multiple criteria greatly increase the risk of recurrence, extracutaneous disease, and mortality.<sup>2,5</sup> The appropriate use of radiologic imaging can result in early identification of tumor progression, improved prognostic accuracy, and early intervention.

While BCC is rarely metastatic, large or aggressive tumors can infiltrate critical anatomic structures, such as the orbit. The deeply infiltrating growth pattern of DFSP can make tumor extent difficult to predict based on a clinical examination alone, especially when located on the head and neck. DFSP can invade skeletal muscle, and preoperative imaging can help guide surgical treatment.

MCC is associated with a high rate of nodal and distant metastasis, and imaging can facilitate staging and adjuvant therapy. Imaging is an indispensable tool for the detection of nodal and distant disease and staging of aggressive cutaneous neoplasms.

The most common indications for imaging studies are summarized in [Table I](#).

Computed tomography (CT) scans, magnetic resonance imaging (MRI) scans, radiolabeled 18-fluorodeoxyglucose (18-FDG) positron emission tomography (PET) scans, and ultrasonography (US) are all used in these clinical scenarios. Depending on the clinical scenario and tumor type,  $\geq 1$  of these imaging studies may be necessary to adequately assess the extent of locoregional and distant disease. The material presented here can help optimize the evaluation of patients with advanced skin cancers and facilitate communication with other medical specialists involved in the patient's care. Consultation with a radiologist is strongly encouraged to determine the best study or combination of imaging studies for any given patient and to optimize the use of imaging resources ([Table II](#)).<sup>6</sup> A review of aggressive skin cancer cases in the setting of a hospital-based

**Table I.** Indications for radiologic imaging of skin cancers

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Possible bony invasion
Possible orbital invasion
Assessment of the extent of tumor invasion in soft tissue
Staging of lymph nodes and metastatic disease
Evaluation for potential perineural spread
Post operative surveillance for recurrent disease

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**Table II.** How to communicate clearly with your radiologist: What they need to know\*

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Tumor characteristics
Type/subtype of tumor
Primary vs recurrent
Location
Patient characteristics
Age
Allergies, particularly to contrast agents
Implantable devices, metal, or other foreign bodies
History of claustrophobia
Renal impairment
Ensure a recent creatinine and/or glomerular filtration rate
Consideration of radiation dose (ie, children, women of childbearing age)
Imaging-specific considerations
Primary clinical question (ie, evaluate for extent of lesion, bony invasion, perineural invasion, muscle invasion, etc)
Anatomic structures would you like included
Type of evaluation (ie, preoperative planning, staging, postoperative surveillance, possible recurrence, etc)
History of previous or forthcoming studies (for correlation by the radiologist)

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multispecialty tumor board can also guide decision-making.

## CLINICAL INDICATIONS FOR IMAGING

### Bony invasion

#### Key points

- **A computed tomography scan is indicated when bony invasion by tumor is suspected**
- **High-resolution bone windows can increase sensitivity of detection**

While aggressive skin tumors often follow the path of least resistance along nerves and tissue planes, they may also invade bone. Locally

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