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NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®)

Dermatofibrosarcoma Protuberans

Version 1.2022 — November 17, 2021

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Updates in Version 1.2022 of the NCCN Guidelines for Dermatofibrosarcoma Protuberans from Version 1.2021 include:

DFSP-1

• Clinical Presentation

- ▶ Workup, fourth bullet revised: Consider preoperative MRI with contrast for treatment planning if extensive **extracutaneous subcutaneous extension or a recurrent tumor** is suspected.
- Footnote b, last sentence removed: Biopsy closures are encouraged to be kept small so as not to distort the anatomy for definitive excision.
- Footnote d revised: If fibrosarcomatous changes/malignant transformations are noted **found, multidisciplinary consultation for consideration of further treatment and surveillance is recommended. See the NCCN Guidelines for Soft Tissue Sarcoma for multimodal therapy and surveillance considerations. Multidisciplinary consultation is recommended for other high-risk features.** (Also page DFSP-2)

DFSP-2

• Treatment

- ▶ Header revised: Excision with Mohs micrographic surgery (MMS) or other forms of **GCPDMA peripheral and deep en face margin assessment (PDEMA).**
- Revised footnotes
 - ▶ Footnote e: The most commonly used form of ~~complete circumferential peripheral and deep margin assessment (GCPDMA)~~ **PDEMA is Mohs (MMS).** See NCCN Guidelines for Squamous Cell Skin Cancer - Principles of GCPDMA PDEMA Technique. ~~If GCPDMA is unavailable, consider wide excision. Wide undermining is discouraged due to the difficulty of interpreting subsequent re-excisions pathologically and the risk of concealing residual tumor below immobilized tissue. See Principles of Excision (DFSP-B).~~ **When anatomic structures at the deep margin (eg, major vessels, nerves, bone) preclude complete histologic evaluation of the marginal surface via Mohs or other forms of PDEMA, Mohs or other forms of PDEMA should be used to evaluate as much of the marginal surface as feasible. Treatment considerations for non-visualized areas may be the subject of multidisciplinary discussion.**
 - ▶ Footnote g: Consider neoadjuvant imatinib for patients in whom resection **with negative margins may result in unacceptable functional or cosmetic outcomes.** ~~is not anticipated to achieve negative margins without unacceptable functional or cosmetic outcomes.~~ *Ugurel S, et al. Clin Cancer Res 2014;20:499-510.*
 - ▶ Footnote j: ~~For negative margins~~ **When Mohs or other forms of PDEMA are utilized, RT is not recommended. When Mohs or other forms of PDEMA are not utilized, consider RT if margins are <1 cm.** RT can be considered for treatment of positive margins if not given previously and further resection is not feasible.
 - ▶ Footnote k: ~~Tumors lacking the t(17;22) rearrangement may not respond to imatinib. Cytogenetic analysis (molecular or conventional) of a tumor may be useful prior to the institution of imatinib therapy.~~ *Navarrete-Dechent C, et al. JAMA Dermatol 2019;155:361-369.*
- Footnote f added: If PDEMA is unavailable, consider wide excision. Wide undermining is discouraged prior to confirmation of clear margins due to the difficulty of interpreting subsequent re-excised margins, and the risk of concealing residual tumor below mobilized tissue. See Principles of Excision (DFSP-B).

[Continued](#)



Updates in Version 1.2022 of the NCCN Guidelines for Dermatofibrosarcoma Protuberans from Version 1.2021 include:

DFSP-A

• Principles of Pathology

- ▶ **First bullet revised:** Evaluation by a qualified physician with specific expertise in *sarcoma/soft tissue pathology or dermatopathology* is preferred (if available).
- ▶ **Fourth bullet revised:** Fibrosarcomatous transformation (FS-DFSP) is reflected by *characterized by transition from storiform to a herringbone pattern, with a higher degree of cellularity, cytologic atypia, mitotic activity (>5/10 high-power fields [HPF]), and negative frequent loss of CD34 immunostaining.*
- ▶ **Sixth bullet revised:** Margin control during excision (*see Principles of Excision*) may require *occasionally be aided by H&E sections supplemented by CD34 immunohistochemistry.*

- **Footnote 2 revised:** FS-DFSP should be noted when present as *the metastatic risk is 15%–20% and the patient should be referred to a center with expertise in management of soft tissue sarcomas.* ~~as it is associated with a poor prognosis.~~

DFSP-B

• Principles of Excision

- ▶ **Goal, bullet revised:** Every effort should be made to achieve clear surgical margins. Complete histologic surgical margin examination to include review of the entire excised peripheral and deep margin is recommended, whenever possible. Tumor characteristics include long, irregular, subclinical extensions. *Debulking* Specimens from ~~debulking/Mohs~~ all excisions should be examined to identify fibrosarcomatous transformation (FS-DFSP) since this is associated with metastatic potential.
- ▶ **Surgical approach, heading revised:** Mohs Micrographic Surgery or Other Forms of ~~GCPDMA PDEMA~~.
- ◊ **First bullet revised:** See NCCN Guidelines for Squamous Cell Skin Cancer - Principles of ~~GCPDMA-PDEMA~~ Technique.
- ◊ **Second bullet revised:** If ~~GCPDMA Mohs or other forms of PDEMA~~ are unavailable, consider wide excision.
 - **First sub-bullet removed:** If there is concern that the surgical margins are not completely clear, consider avoiding repair with a flap or other technique, as it may impede monitoring of the site and delay detection of a recurrence. Split-thickness skin grafting (STSG) may be considered.
 - **Second sub-bullet removed:** It is recommended that any reconstruction involving extensive undermining or tissue movement be avoided or delayed until negative histologic margins are verified to prevent subclinical tumor persistence, particularly inadvertent concealment of residual tumor below repositioned tissue or a repair.
 - **New sub-bullet added:** Reconstruction should be delayed until clear margins have been verified to avoid the risk of translocating tumor within the resection bed making further margin assessments inaccurate.

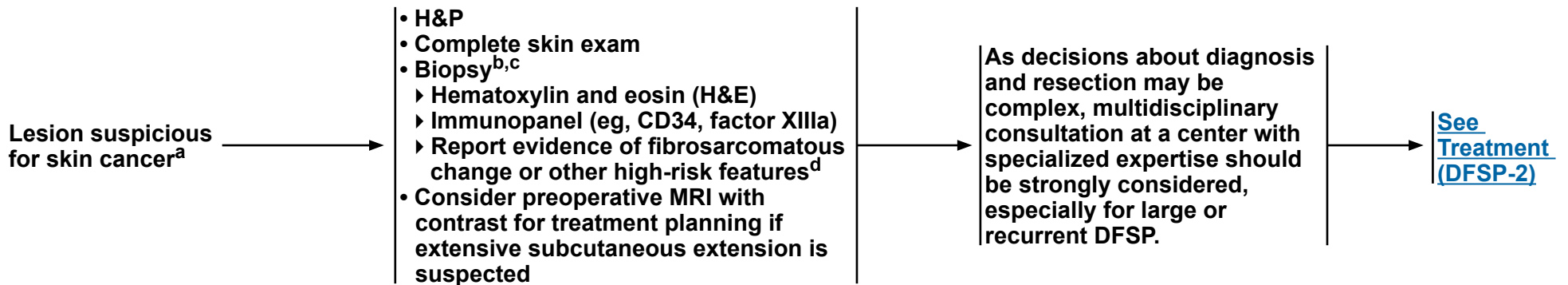
DFSP-C

• Principles of RT

- ▶ **General Treatment Information, Adjuvant RT, Negative margins:**
 - ◊ **First sub-bullet revised:** *When Mohs or other forms of PDEMA are utilized,* RT is not recommended.
 - ◊ **New sub-bullet added:** *When Mohs or other forms of PDEMA are not utilized,* consider RT if margins are <1 cm.

CLINICAL PRESENTATION

WORKUP



^a For more information, see [American Academy of Dermatology Association](#).

^b This tumor is frequently misdiagnosed due to inadequate tissue sampling/superficial biopsy. Punch, incisional, or core biopsy, preferably including the deeper subcutaneous layer, is strongly recommended for sufficient tissue sampling and accurate pathologic assessment. If biopsy is indeterminate or clinical suspicion remains, rebiopsy is recommended. Wide undermining is discouraged due to the difficulty of interpreting subsequent re-excisions pathologically.

^c [Principles of Pathology \(DFSP-A\)](#).

^d If fibrosarcomatous transformation is found, multidisciplinary consultation for consideration of further treatment and surveillance is recommended. See the [NCCN Guidelines for Soft Tissue Sarcoma](#) for multimodal therapy and surveillance considerations.

Note: All recommendations are category 2A unless otherwise indicated.

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Dermatofibrosarcoma Protuberans

TREATMENT

Excision with Mohs or other forms of peripheral and deep en face margin assessment (PDEMA)^{d,e,f,g}

Negative surgical margins

Positive surgical margins

Re-resection^{e,f} until margins clear or surgery not possible

Negative margins

Positive margins

ADJUVANT TREATMENT

Observation

Multidisciplinary consultation for consideration of RT^{h,j} vs. other treatment options

FOLLOW-UP

- Physical exam with focus on primary site every 6–12 monthsⁱ
- Patient education about regular self-exam

Recurrence

Metastasis

THERAPY FOR RECURRENCE/METASTASIS

Re-resection if feasible (preferred)^{e,f} or RT^{h,j} if not given previously and resection not feasible or Consider imatinib^k in cases where disease is unresectable, or unacceptable functional or cosmetic outcomes will occur with resection

Multidisciplinary consultation^l

^d If fibrosarcomatous transformation is found, multidisciplinary consultation for consideration of further treatment and surveillance is recommended. See the [NCCN Guidelines for Soft Tissue Sarcoma](#) for multimodal therapy and surveillance considerations.

^e The most commonly used form of PDEMA is Mohs. [See NCCN Guidelines for Squamous Cell Skin Cancer - Principles of PDEMA Technique](#). When anatomic structures at the deep margin (eg, major vessels, nerves, bone) preclude complete histologic evaluation of the marginal surface via Mohs or other forms of PDEMA, Mohs or other forms of PDEMA should be used to evaluate as much of the marginal surface as feasible. Treatment considerations for non-visualized areas may be the subject of multidisciplinary discussion.

^f If PDEMA is unavailable, consider wide excision. Wide undermining is discouraged prior to confirmation of clear margins due to the difficulty of interpreting subsequent re-excised margins, and the risk of concealing residual tumor below mobilized tissue. [See Principles of Excision \(DFSP-B\)](#).

^g Consider neoadjuvant imatinib for patients in whom resection with negative margins may result in unacceptable functional or cosmetic outcomes. Ugurel S, et al. *Clin Cancer Res* 2014;20:499-510.

^h [See Principles of Radiation Therapy \(DFSP-C\)](#).

ⁱ MRI with contrast may be helpful to detect early recurrence in patients with high-risk lesions or delineate tumor extent when physical exam is insufficient or unreliable.

^j When Mohs or other forms of PDEMA are utilized, RT is not recommended. When Mohs or other forms of PDEMA are not utilized, consider RT if margins are <1 cm. RT can be considered for treatment of positive margins if not given previously and further resection is not feasible.

^k Navarrete-Dechent C, et al. *JAMA Dermatol* 2019;155:361-369.

^l [See NCCN Guidelines for STAGE IV Soft Tissue Sarcoma \(EXTSARC-5\)](#).

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PRINCIPLES OF PATHOLOGY¹

- Evaluation by a qualified physician with specific expertise in sarcoma/soft tissue pathology or dermatopathology is preferred (if available).
- The spindled cells arranged in a storiform or fascicular pattern are typically bland with minimal cytologic atypia.
- Immunohistochemistry for CD34 is mostly positive, and factor XIIIa negative.
- Fibrosarcomatous transformation (FS-DFSP) is characterized by transition from storiform to a herringbone pattern, with a higher degree of cellularity, cytologic atypia, mitotic activity (>5/10 high-power fields [HPFs]), and frequent loss of CD34 immunostaining.²
- For equivocal lesions, consider fluorescence in situ hybridization (FISH), polymerase chain reaction (PCR), or conventional cytogenetics to detect t(17;22)(q22;q13), which is a hallmark of DFSP. Fusion of the collagen type I alpha 1 gene (*COL1A1*) at 17q22, with the platelet-derived growth factor Beta gene (*PDGFβ*) at 22q13, form the oncogenic chimeric fusion gene *COL1A1-PDGFB*.
- Margin control during excision ([see Principles of Excision \[DPSP-B\]](#)) may occasionally be aided by H&E sections supplemented by CD34 immunohistochemistry.

¹ Currently, no American Joint Committee on Cancer (AJCC) or College of American Pathologists (CAP) synoptic reporting is defined.

² FS-DFSP should be noted when present as the metastatic risk is 15%–20% and the patient should be referred to a center with expertise in management of soft tissue sarcomas.

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PRINCIPLES OF EXCISION

Goal:

- Every effort should be made to achieve clear surgical margins. Complete histologic surgical margin examination to include review of the entire excised peripheral and deep margin is recommended, whenever possible. Tumor characteristics include long, irregular, subclinical extensions. Debulking specimens from all excisions should be examined to identify fibrosarcomatous transformation (FS-DFSP) since this is associated with metastatic potential.

Surgical Approach: Mohs or Other Forms of PDEMA

- [See NCCN Guidelines for Squamous Cell Skin Cancer - Principles of PDEMA Technique.](#)
- If Mohs or other forms of PDEMA are unavailable, consider wide excision.
 - ▶ Reconstruction should be delayed until clear margins have been verified to avoid the risk of translocating tumor within the resection bed making further margin assessments inaccurate.

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PRINCIPLES OF RADIATION THERAPY

General Treatment Information

• Adjuvant RT:

▶ Positive Margins/Gross Disease

- ◊ 50–60 Gy for indeterminate or positive margins, and up to 66 Gy for positive margin or gross tumor (2-Gy fractions per day).
- ◊ Fields to extend widely beyond surgical margin (eg, 3–5 cm) when clinically feasible.

▶ Negative Margins

- ◊ When Mohs or other forms of PDEMA are utilized, RT is not recommended.
- ◊ When Mohs or other forms of PDEMA are not utilized, consider RT if margins are <1 cm.

• Recurrence/Metastasis:

- ▶ RT if not given previously and further resection is not feasible; 50–60 Gy for indeterminate or positive margins, and up to 66 Gy for positive margin or gross tumor (2-Gy fractions per day).
- ▶ Fields to extend widely beyond surgical margin (eg, 3–5 cm) when clinically feasible.

Note: All recommendations are category 2A unless otherwise indicated.

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NCCN Categories of Evidence and Consensus

Category 1	Based upon high-level evidence, there is uniform NCCN consensus that the intervention is appropriate.
Category 2A	Based upon lower-level evidence, there is uniform NCCN consensus that the intervention is appropriate.
Category 2B	Based upon lower-level evidence, there is NCCN consensus that the intervention is appropriate.
Category 3	Based upon any level of evidence, there is major NCCN disagreement that the intervention is appropriate.

All recommendations are category 2A unless otherwise indicated.



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Discussion

This discussion corresponds to the NCCN Guidelines for Dermatofibrosarcoma Protuberans. Last updated: Dec 16, 2014.

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Dermatofibrosarcoma Protuberans

Overview

Dermatofibrosarcoma protuberans (DFSP) is an uncommon, low-grade sarcoma of fibroblast origin with an incidence rate of 4.2 to 4.5 cases per million persons per year in the United States.^{1,2} It rarely metastasizes. However, initial misdiagnosis, prolonged time to accurate diagnosis, and large tumor size at the time of diagnosis are common. Three-dimensional reconstruction of DFSP³ has revealed tumors with highly irregular shapes and frequent finger-like extensions.⁴ As a result, incomplete removal and subsequent recurrence are common. The local recurrence rate for DFSP in studies ranges from 10% to 60%, whereas the rate of development of regional or distant metastatic disease is only 1% and 4% to 5%, respectively.⁵

The NCCN Non-Melanoma Skin Cancer Panel has developed these guidelines outlining the treatment of DFSP to supplement their other guidelines ([NCCN Guidelines for Basal Cell and Squamous Cell Skin Cancers](#) and [NCCN Guidelines for Merkel Cell Carcinoma](#)). This guideline also received expert input from the NCCN Soft Tissue Sarcoma Panel during its initial development.

Diagnosis

As with all solid tumors, clinical suspicion is confirmed by biopsy. A Principles of Pathology section has been added to the algorithm. Histologically, DFSP typically presents as a storiform or fascicular proliferation of bland spindled cells that extends from the dermis into the subcutis.^{6,7} Virtually all cases are CD34-positive and factor XIIIa-negative with rare exceptions.^{8,9} Currently, no synoptic reporting is recommended.

In most cases, examination of hematoxylin and eosin-stained specimens by light microscopy results in an unequivocal diagnosis. However, differentiation of DFSP from dermatofibroma can be difficult,

at times. In such instances, immunostaining with CD34, factor XIIIa, nestin, apolipoprotein D, and cathepsin K may be useful.¹⁰⁻¹² The panel recommends that appropriate and confirmatory immunostaining be performed in all cases of suspected DFSP. Finally, it is unclear whether the histologic features of a high mitotic rate or evidence of fibrosarcomatous change (typically in more than 5% of the surgical specimen) have prognostic significance in DFSP. Studies in the biomedical literature both support^{13,14} and refute¹⁵ this notion. Thus, the panel requested that fibrosarcomatous change and other high-risk features (such as deep lesions and high grade) be noted in all pathology reports assessing this tumor. Clinicians should consult the [NCCN Guidelines for Soft Tissue Sarcoma](#) when fibrosarcomatous transformations are present.

As the superficial aspect of a DFSP may appear similar to other benign lesions, panelists strongly recommend a deep subcutaneous punch biopsy or incisional biopsy. This will enhance pathologic assessment to avoid misdiagnosis. When the clinician's suspicion for DFSP is high, but the initial biopsy does not support the diagnosis, re-biopsy is recommended and may reveal tumor presence. Wide undermining of the skin is discouraged because it may potentially result in tumor-seeding. It can also interfere with pathologic examination of re-excisions.

Because metastatic disease is rare, an extensive workup is not routinely indicated unless suggestive aspects in the history and physical (H&P) examination or adverse prognostic histologic features are present. Patients with high-risk features may benefit from multidisciplinary consultation as it may optimize clinical and reconstructive outcomes.¹⁶



Treatment

Initial treatment of DFSP is surgical. Because of its proclivity for irregular and frequently deep subclinical extensions, every effort should be made to completely remove this tumor at the time of initial therapy. If initial surgery yields positive margins, re-resection is recommended whenever possible, with the goal of achieving clear margins. The surgical approach to DFSP must be meticulously planned. Size and location of the tumor as well as cosmetic issues will dictate the most appropriate surgical procedure. As noted in the algorithm, some form of complete histologic assessment of all surgical margins before reconstruction is preferred. See [NCCN Guidelines for Soft Tissue Sarcoma](#) for principles of sarcoma surgery. Mohs or modified Mohs surgery,^{3,4,17-24} and traditional wide excision,²⁵ typically with 2- to 4-cm margins to investing fascia that are subsequently verified to be clear by traditional pathologic examination, are all methods to achieve complete histologic assessment.^{18,26,27} A large retrospective series of 204 patients with DFSP showed a very low local recurrence rate (1%) using wide excision with a standardized surgical approach, underscoring the importance of meticulous pathologic margin evaluation with any surgical technique.²⁷ Two systematic reviews found a lower rate of recurrence with Mohs surgery compared to wide local excision.^{28,29} In a retrospective review of 48 patients, positive margins were more frequent with wide excision than with Mohs, but the local recurrence rates were statistically similar.³⁰ It is recommended that any reconstruction involving extensive undermining be avoided. Tissue movement, if necessary, should be delayed until negative histologic margins are verified to prevent possible tumor seeding if margins are not histologically clear. If there is concern that the surgical margins are not completely clear, split-thickness skin grafting should be considered to monitor for recurrence. A retrospective study of 19 patients suggests that coordinated efforts of a team of Mohs surgeon, surgical oncologist,

dermatopathologist, and plastic surgeon can enhance oncologic and reconstructive outcomes.¹⁶

DFSP is characterized by a translocation between chromosomes 17 and 22 [t(17;22)(q22;q13)] resulting in the overexpression of platelet-derived growth factor receptor β (PDGFRB).³¹⁻³³ These findings suggest that targeting PDGF receptors may lead to the development of new therapeutic options for DFSP. In published results, imatinib mesylate, a protein tyrosine kinase inhibitor, has shown clinical activity against localized and metastatic DFSP tumors containing t(17;22)(q22;q13).³⁴⁻³⁸ Imatinib mesylate has been approved by the FDA for the treatment of unresectable, recurrent, and/or metastatic DFSP in adult patients.³⁹ It may be considered in cases where the disease is unresectable following multiple resections, or if unacceptable functional or cosmetic outcomes would occur with further resection. Because tumors lacking the t(17;22) translocation may not respond to imatinib, molecular analysis of a tumor using cytogenetics may be useful prior to the institution of imatinib therapy.

Radiation has occasionally been used as a primary therapeutic modality for DFSP,⁴⁰ but it is more commonly used as adjuvant therapy after surgery.⁴¹⁻⁴⁵ In a single-institution retrospective review of 53 patients, surgery and radiation achieved an excellent local control rate and disease-free survival of 93% at 10 years.⁴⁶ About half of the patients in the study presented initially with recurrent disease. Another small patient series reported that 86% of patients treated with radiation (mostly after surgery) remained disease-free at a median follow-up of 10.5 years.⁴⁷ Postoperative radiation therapy is a preferred option for positive surgical margins if further resection is not feasible. If a negative margin is achieved, no adjuvant treatment is necessary.

Recurrent tumors should be resected whenever possible. Adjuvant radiation may be considered after surgery. For patients who are not



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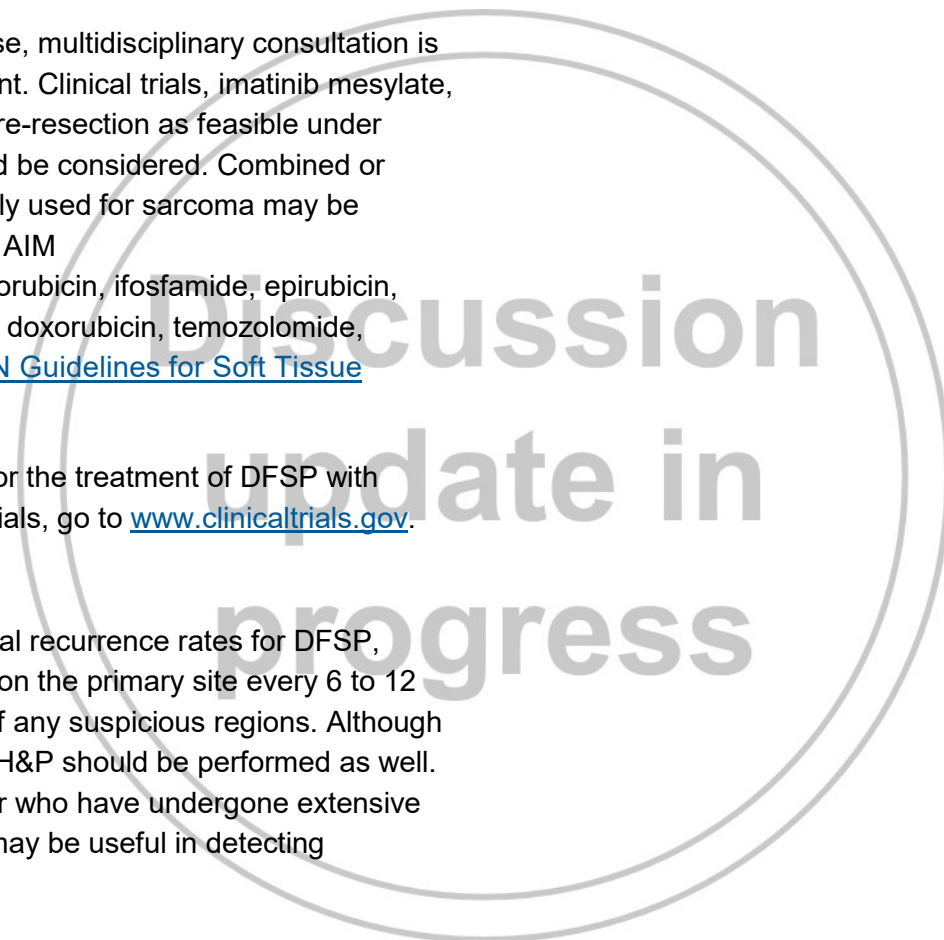
surgical candidates, radiation therapy alone is an option if not given previously. Imatinib mesylate should be considered if this is not possible, or if additional resection would lead to unacceptable functional or cosmetic outcomes.

In the rare event of metastatic disease, multidisciplinary consultation is recommended to coordinate treatment. Clinical trials, imatinib mesylate, chemotherapy, radiation therapy, or re-resection as feasible under specific clinical circumstances should be considered. Combined or single-agent chemotherapy commonly used for sarcoma may be considered for DFSP. These include AIM (doxorubicin/ifosfamide/mesna), doxorubicin, ifosfamide, epirubicin, gemcitabine, dacarbazine, liposomal doxorubicin, temozolomide, vinorelbine, or pazopanib (see [NCCN Guidelines for Soft Tissue Sarcoma](#)).

Several clinical trials are underway for the treatment of DFSP with imatinib. To access current clinical trials, go to www.clinicaltrials.gov.

Follow-up

Finally, given the historically high local recurrence rates for DFSP, ongoing clinical follow-up with focus on the primary site every 6 to 12 months is indicated, with re-biopsy of any suspicious regions. Although metastatic disease is rare, a guided H&P should be performed as well. For patients with high-risk features or who have undergone extensive surgery, additional imaging studies may be useful in detecting recurrence.



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