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Review

Desmoid fibromatosis: interventional radiology (sometimes) to the rescue for an atypical disease

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Abstract

Desmoid fibromatosis (DF) is a rare locally aggressive soft tissue tumour that is characterized as benign as it cannot metastasize. It was managed until recently like sarcomas, that is, with radical surgical resection combined or not with radiotherapy. However, this approach was associated with a high rate of recurrence and significant morbidity. The management of this disease has progressively changed to a more conservative approach given the fact that DF may spontaneously stop to grow or even shrink in more than half of the cases. Should treatment be required, recent guidelines recommend choosing between systemic therapies, which include principally chemotherapy and tyrosine kinase inhibitors, and local treatments. And this is where the interventional radiologist may have an important role in treating the disease. Various ablation modalities have been reported in the literature to treat DF, notably high-intensity focused ultrasound and cryoablation. Results are promising and cryoablation is now mentioned in recent guidelines. The interventional radiologist should nevertheless apprehend the disease in its globality to understand the place of percutaneous treatments among the other therapeutic options. The goal of this review is therefore to present and discuss the role of interventional radiology in the management of DF.

Keywords: desmoid; desmoid fibromatosis; cryoablation; interventional radiology.

Introduction: what is desmoid fibromatosis?

According to the World Health Organization, desmoid fibromatosis (DF) is a clonal fibroblastic proliferation that arises in the deep soft tissues and is characterized by infiltrative growth and a tendency toward local recurrence but an inability to metastasize.[1,2] DF accounts for <3% of soft tissue neoplasms; its incidence is estimated to range between 3 and 5 cases per million with a peak age of 30-40 years and a higher incidence in the female population.[3-5] The majority of DF occurs sporadically and is located extra-abdominally in the extremities or in the trunk. Up to 10% of DF happens in patients suffering from familial adenomatous polyposis (FAP). In this setting, DF occurs preferentially intra-abdominally.[5-7] DF may sometimes be multifocal, usually in the same area of the body. Associations with trauma, surgery, pregnancy, and oral contraceptives have been noted with both appearance and progression of the disease.[6] Even though DF is considered a nonmalignant disease, the management of this condition is usually performed in expert sarcoma centres given the potential local aggressiveness of this tumour that may lead to severe psychological and physical complications, especially in case of large to very large tumours.[6] It may even compromise life expectancy in life-threatening locations (thorax, abdomen).[8] The goal of this review is to present and discuss the role of interventional radiology (IR) in the management of DF.

More insights about DF: genetic and pathologic features

The pathogenesis of DF is linked to the dysregulation of the Wnt (wingless/integrated) pathway that regulates the turnover and degradation of β-catenin.[9,10] β-Catenin is a proto-oncogene coded by the CTNNB1 gene and is implicated in the onset, progression, and malignant transformation of several tumours. The concentration of β-catenin is down regulated by the adenomatous polyposis coli (APC) protein coded by the APC gene. Sporadic DF is associated with CTNNB1 β-catenin mutations, with the 3 most frequent mutations occurring on CTNNB1 exon 3 and including T41A (∼55%), S45F (∼35%), and S45P (∼10%).[11,12] The S45F mutation has been reported to be associated with poorer outcomes. On the other hand, syndromic DF is associated with a germline mutation of APC. In both situations, there is a loss of down-regulation of the cytosolic β-catenin. CTNNB1 and APC mutations are mutually exclusive in DF. Hence, detection of a CTNNB1 mutation helps to exclude syndromic DF while a CTNNB1 wild-type status of DF should raise suspicion of a syndromic condition such as FAP.[13]

Macroscopically, DF is a firm tumour that appears whitish/grey, mimicking scar tissue. Microscopically, the most frequent pattern is composed by a collagenous stroma filled with long fascicles of elongated, thin, spindled cells of uniform appearance and prominent blood vessels. Cytological atypias are typically minimal and the mitotic rate usually

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low.[12-14] Diagnosis is now made on percutaneous samples, as incisional/excisional biopsy is not recommended anymore as the initial diagnostic modality.[5,15]

The game changer of DF management: the natural course of the disease

Until the 2000s, the management of DF was similar as soft tissue sarcomas, that is, that open surgical resection with negative margins was the cornerstone of treatment.[16] Adjuvant radiotherapy was sometimes offered but without any clear benefit in the literature for cases with R0 resection.[17] Given the morbidity of resection, the high rate of R1 excision and the high rate of postoperative recurrences (reported to be as high as 77%), the indications for surgery as the primary preferred therapy have progressively been questioned.[13,18] This progressively led to a better comprehension of the natural course of the disease as upfront surgery was less and less performed. In 2017, Penel et al did not find a significant difference over 771 cases of DF in the 2-year event-free survival between surgical resection and the wait-and-see approach.[19] More recently, 2 prospective observational studies demonstrated that a significant percentage of DF will spontaneously stabilize or even regress without any active treatment.[20,21] Over 108 consecutive patients, Colombo et al reported a 3-year progression-free survival and a 3-year treatment-free survival of 54.5% and 65.9%, respectively. Of note, initial spontaneous regression was noted in 25% of the cases. This may explain why a systematic review from 2018 failed to find any clear difference between 4 strategies of first-line treatment (active surveillance, surgery alone, radiotherapy alone, and surgery plus radiotherapy).[22] To summarize, the natural course of DF is variable as tumours may progress or on the contrary spontaneously stabilize or even regress partially or completely. Hence, watchful waiting should be the initial 'treatment' of DF according to recent guidelines.[5,17,23]

Non-IR treatment options in 2024

The armamentarium for the management of DF has evolved over the years thanks to a better comprehension of the disease and the development of new treatment modalities.

Active surveillance

Given the natural history of DF, active surveillance plays a key role in the management of this disease provided that adequate pain management is delivered to the patient during the period of follow-up. Recommendations for watchful waiting is to re-assess the patient clinically and radiologically with MRI (or CT scan if MRI is contraindicated) every 3-6 months during the first 2-3 years and every 6-12 months thereafter.[13] If it is clinically possible, 3 consecutive progressions should be observed before considering treatment.[17] Critical anatomical sites (notably neck or mesentery) may benefit from shortened intervals of reassessment to avoid postponing adequate therapy.[13]

Local treatments that are no longer first-line options

Surgery

As stated previously, surgical resection of DF is associated with a high rate of local relapse. Rates of local recurrence range between 30% and 77% in studies with long follow-up.[13] A significant percentage of excision is also associated with positive margins. Intriguingly, there is still debate whether a postoperative positive margin is a positive predictive factor for local recurrence or not.[13,24,25] Best outcomes with surgery are observed for DF in the abdominal wall.[25] Besides suboptimal local control, the morbidity of surgery as well as the availability of other options have progressively led to stop recommending surgery as a first-line therapy.[17] It is now accepted that the best indication for surgery is the second-line treatment of a significantly progressing disease when morbidity is acceptable (typically parietal locations).[26]

Radiotherapy

Radiotherapy has been proposed in various clinical scenarios of treatment of DF, including stand-alone treatment and adjuvant treatment after surgery with and without residual disease.[13,17] In the adjuvant scenario, a meta-analysis showed that radiation therapy did not seem to decrease the rate of local recurrence after R0 resection but decreased this risk after R1 resection.[27] A phase II trial studied the efficacy of moderate-dose radiotherapy (56 Gy in 28 fractions) as a stand-alone treatment, with a 3-year local control rate of 81.5%.[28] Complete response during the first 3 years was observed in 6 of 44 patients (13.6%). The major concern about radiotherapy in this young and otherwise healthy population is the risk of radiation-induced sarcoma.[29,30] Hence, its use should be limited to specific cases, typically with symptomatic progressive DF, for which other local treatments (surgery or percutaneous ablation) are not an option and for which systemic medical therapy fails to control the disease.[13]

Other options for local management of DF

Apart from percutaneous interventions that represent a valuable local option and are discussed in the next section, hyperthermic isolated limb perfusion has also been reported to treat DF.[13,31-33] Given the complexity of the procedure and the lack of data, this treatment modality is not included in the clinical practice of most expert centres.

Systemic treatments that are no longer considered effective to control DF

Antioestrogens and nonsteroidal anti-inflammatory drugs (NSAID) are treatments that were historically recommended as first-line systemic therapies, based on the expression of oestrogen receptor and overexpression of COX-2 by DF.[34,35] One systematic review issued in 2011 suggested that antioestrogen therapy was producing some effect in about one-half of patients with DF, but the data were extracted from case series and single-arms trials and therefore considered of moderate quality.[13,36] Observational studies investigating the efficacy of an NSAID which inhibits both COX-1 and COX-2 showed variable results.[34,37,38] Given the uncertainty of the efficacy of antioestrogen and NSAID to obtain local control, these treatments are no longer considered disease-modifying agents.

Systemic treatments that may be indicated

Chemotherapy

Different chemotherapy regimens have been proposed and reported in the literature. Main ones include low-dose methotrexate plus vinblastine or vinorelbine, oral vinorelbine alone and a conventional dose anthracycline regimen.

A systemic review issued in 2023 reported disease control rates ranging between 71% and 100% for low-dose

methotrexate plus vinblastine or vinorelbine and 64% for oral vinorelbine alone.[39] With a low-dose regimen, tumour response usually happens within months after the beginning of treatment and may continue after treatment cessation.[13] Conventional chemotherapy is supposed to achieve faster tumour shrinkage and better local control than other regimens.[40] To date, prospective data are only available for the low-dose protocol.[41,42] Chemotherapeutic treatments are typically discontinued once tumour response is obtained or in case of poor tolerability, with the possibility to repeat the protocol in case of a recurrence and good tumour response with the corresponding regimen.[17]

Tyrosine kinase inhibitors

Tyrosine kinase inhibitors (TKIs) act by inhibiting tyrosine kinases which are implicated in the development of various cancers. Even though the mechanism of action has not been fully elucidated in DF, one particular target for TKIs may be the platelet-derived growth factor receptor β which has been reported to drive the growth of DF.[13,10,43] Sorafenib, pazopanib, imatinib, and sunitinib are the 4 current different TKIs recommended in DF.[44] Several prospective observational and randomized studies versus placebo or antioestrogen support the significant benefit of these drugs in DF with progressive disease.[45-48] Contrary to chemotherapy, TKIs are usually administrated without discontinuation until disease progression or apparition of side effects.[13] Development of permanent hypertension or thyroid dysfunction is a particular concern of these medications especially in such a young population.[13,49] Moreover, the long-term safety and optimal dosage of TKIs in DF remain largely unknown.[43] Hence, their prescription should be adapted to the severity of the disease, starting with the therapy with the least expected toxicity.[13]

Other systemic treatments being investigated

Wnt inhibitors, sirolimus, immunotherapy, and γ-secretase inhibitors have all been tested in different pilot studies.[13,44,50,51] Given the lack of expression of PD-L1 and the rare presence of PD1 in desmoid tumours, immunotherapy is theoretically unlikely to be effective in DF.[52]

Interventional radiology to treat DF

IR has an increasing role to play in the local management of DF given the lower morbidity of percutaneous interventions compared to surgery and the lower potential toxicity than radiotherapy. Almost all modalities of ablation to ablate locally DF have been reported in the literature.

What has been described so far?

Chemical ablation

Chemical ablation has been reported as early as in 2003 to treat 2 patients suffering from unresectable DF, using acetic acid as the chemical agent.[53] Since then, chemical ablation has not been described in the literature.

Heat-based ablation

Radiofrequency ablation

Tsz-Kan et al described the use of radiofrequency ablation (RFA) to treat DF for the first time in a case report issued in 2007.[54] RFA has then been reported only in case reports and one small case series.[55-58] In the latter paper, there was no recurrence at a mean follow-up of 30 months. Two complications (cellulitis and soft tissue necrosis) occurred. Of note, 3 patients screened for possible treatment did not benefit from RFA because of the proximity (<1 cm) of major nerves.[58]

Microwave ablation

Microwave ablation (MWA) has been studied in one retrospective study enrolling 9 patients.[59] The mean greatest tumoural axis was 10.9 cm. Procedural details, notably a number of impacts as well as duration and output power of MWA, were not detailed. The authors reported a significant decrease in the volume of the tumour at a mean follow-up of 3.7 months, and an improvement in the quality of life in 8/9 patients. One nerve palsy was recorded.

High-intensity focused ultrasound

High-intensity focused ultrasound (HIFU) uses focused ultrasound beams to create coagulation necrosis non-invasively using ultrasound (USgHIFU) or MRI (MRgHIFU) to guide the intervention. MRgHIFU is nowadays considered the gold standard to deliver HIFU for soft tissue lesions because it provides greater visualization of the target lesion in unlimited imaging planes and real-time monitoring using MR thermometry.[60]

The first study mentioning HIFU to treat DF was issued in 2011.[61] In this paper, the authors used USgHIFU to treat 25 extra-abdominal desmoid tumours in 10 patients. They obtained a tumour shrinkage superior to 50% at a mean follow-up of 30 months. The largest series reporting the use of USgHIFU included 122 tumours in 91 patients suffering recurrent DF after surgery.[62] The mean tumour diameter was 9.4 cm. The authors used fractionated ablation over several areas, typically coverage of 60%-80% of the tumour volume for tumours <10 cm and 30%-50% for tumours >10 cm in a single session with monthly repetitions of treatment until satisfactory result was achieved. At a mean follow-up of 28 months, the objective response rate (complete and partial response) was 47.3% and the disease control rate (objective response and stable disease) was 96.7%. Complete response was observed in 15/122 tumours (12.3%). The rate of complications was quite high with 20 skin burns (2 grade III) and 10 nerve injuries (2 permanent deficit). USgHIFU is currently the only modality that is used to treat intra-abdominal DF, a condition which is usually considered as contra-indication for IR treatments.[62-65] For this particular type of DF, Zhao et al and Yang et al reported a reduction of the tumour volume of 58.2% at 12 months in 7 patients and of 59% at a mean follow-up of 29 months in 15 patients, respectively.[63,65] The major concern with this therapy for intra-abdominal location is the risk of bowel perforation.[62,64,65]

MRgHIFU has also been proposed to treat DF.[66-68] Apart from case reports and small case series, the largest multicentric study has been issued in 2024, including 105 patients suffering from extra-abdominal DF who were treated over a 10-year period.[69] In this cohort, the tumour volume decreased from 114 mL prior to treatment to 51 mL at a median follow-up of 15 months after MRgHIFU.[69] Using RECIST criteria, disease control rate was 86%. Fifty percent of the lesions nevertheless presented remaining viable nodules (without an increase in volume) within the tumour. MRgHIFU was associated with a significant decrease in pain score levels. The most frequent complications were low-grade skin burns.

To date, MRgHIFU has not been described for the treatment of intra-abdominal DF.

Cryoablation

Cryoablation (CA) has become the gold standard in musculoskeletal oncology.[70-72] It offers multiple advantages, notably the possibility to treat large to very large tumours thanks to the simultaneous activation of several applicators and the possibility to monitor the iceball with cross-sectional imaging.[72,73] The latter not only allows to assess the coverage of the tumour during the treatment but also to visualize the vicinity of the ice with potential nearby vulnerable organs. Hence, CA is particularly adapted for the ablation of DF which is most of the time large and abutting potentially vulnerable organs such as nerves, bone, or visceral structures (Figures 1 and 2). Another theoretical advantage of CA over heat-based ablation modalities when treating DF next to a nerve is the greater chance of neuronal regrowth and healing in case the nerve is incidentally ablated (Figure 3).[74]

The first publication about the use of CA to treat 5 DF was issued in 2011 by Kujak et al, with the first case being performed in 2004.[75] CA is currently the most frequently reported modality to ablate DF with more than 200 patients treated in small to medium size cohorts of patients (84 patients being the largest cohort in the literature).[76,77] All publications but one were retrospective.[76,78] Overall, the objectives of CA (pain reduction +/- tumour control) varied upon studies as well as the criteria to evaluate the effectiveness of the intervention (variable use of pain scores and RECIST or mRECIST criteria). All papers concluded that CA was safe and effective to achieve disease control and pain control at short- (months) to mid-term (2-3 year) follow-up. Bouhamama et al identified over 84 patients the non-abdominal wall location and previous local treatment (surgery/radiotherapy) as prognostic factors of local recurrence after CA in multivariate analysis.[77] In this study, the largest retrospective cohort to date, the 3-year progression-free survival rate was 68%.

Three systematic reviews and meta-analyses were conducted to bring out more insights about the results of CA in DF. Vora et al published in 2021 a systematic review and meta-analysis of 9 papers.[79] The estimated 1- and 3-year(s) progression-free survival rates were 84.5% and 78%, respectively. The estimated pooled proportion of minor and major complications was 4.2% and 10.2%, with nerve injury being the most frequent major complication. In 2022, a systematic review including 5 studies was issued by Cazzato et al.[80] The authors used stricter inclusion criteria, with small series (<10 patients), treatments without CT or MRI guidance, and studies without mRECIST criteria being excluded. The 1- and 3-year(s) progression-free survival rates ranged 85.1%-85.8% and 77.3%-82.9%, respectively. Complete response was observed in 0%-43.3% and complete pain relief in 40%-66.7%. The rates of major complications were 13.3%-30% across studies, with nerve injury being reported in 4 out of 5 studies. More recently, Bodard et al conducted a systematic review of the safety and efficacy of CA in soft tissue tumours.[71] Looking more specifically at DF, they included 13 papers which represent 393 sessions of CA. The average pain reduction was 79% ± 17% and the tumour volume decrease was 71.5% ± 9.8%.

CRYODESMO-01 is the only prospective study looking at CA for the management of progressive extra-abdominal DF after medical treatment.[78] It is a prospective observational multicentric study in which the primary endpoint was the 12-month nonprogression rate and the secondary endpoints were safety, quality of life, assessment of pain, and functional status. More than 90% of the tumour had to be deemed ablatable in 1 or 2 sessions prior to inclusion. Fifty patients presenting a DF were enrolled and followed clinically and radiologically using mRECIST 1.1 criteria. The median largest diameter was 8.9 cm. The 1-year nonprogression rate was

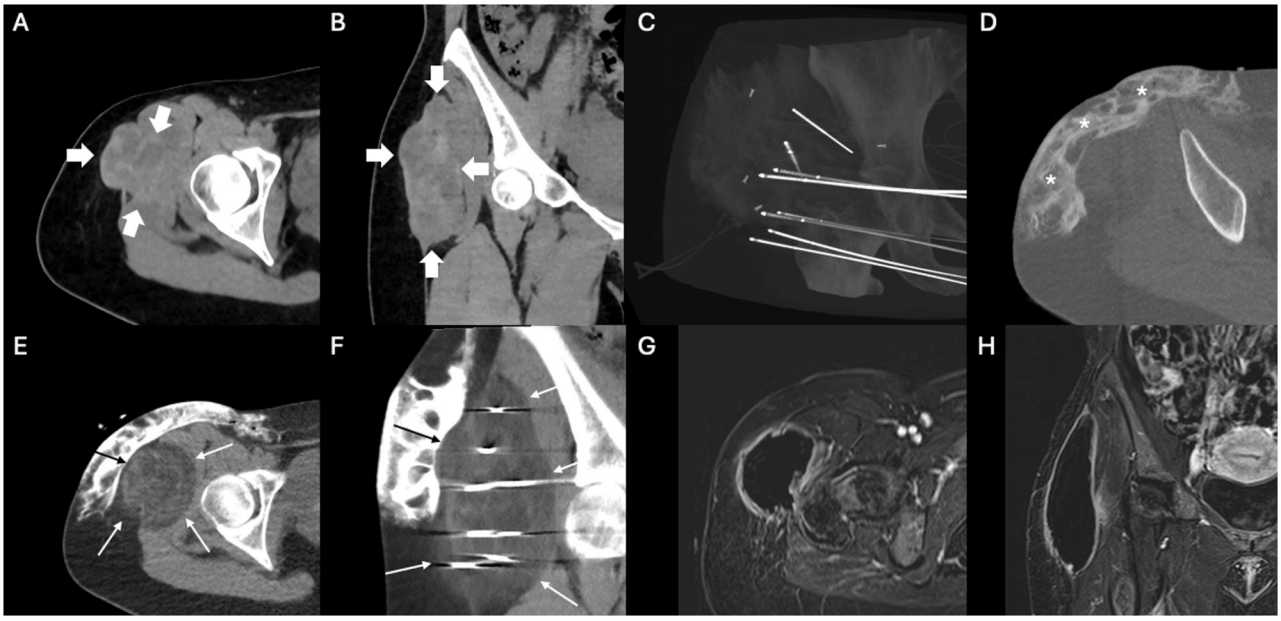

Figure 1. CA of a pelvic DF. Axial (A) and coronal (B) CT scan demonstrate a large DF (large arrows) measuring 4.5X5X11cm. Eight cryoprobes are inserted every 2-2.5 cm (C). Protection of the skin is achieved with mean of hydrodissection using a mixture of saline and contrast (asterisks in D). Axial (E) and coronal (F) CT scan show the hypodense iceball (arrows) covering the tumour without extension into the skin or the nearby hip joint. Axial (G) and coronal (H) contrast-enhanced MRI demonstrate complete devascularization of the tumour. Abbreviation: CA = cryoablation.

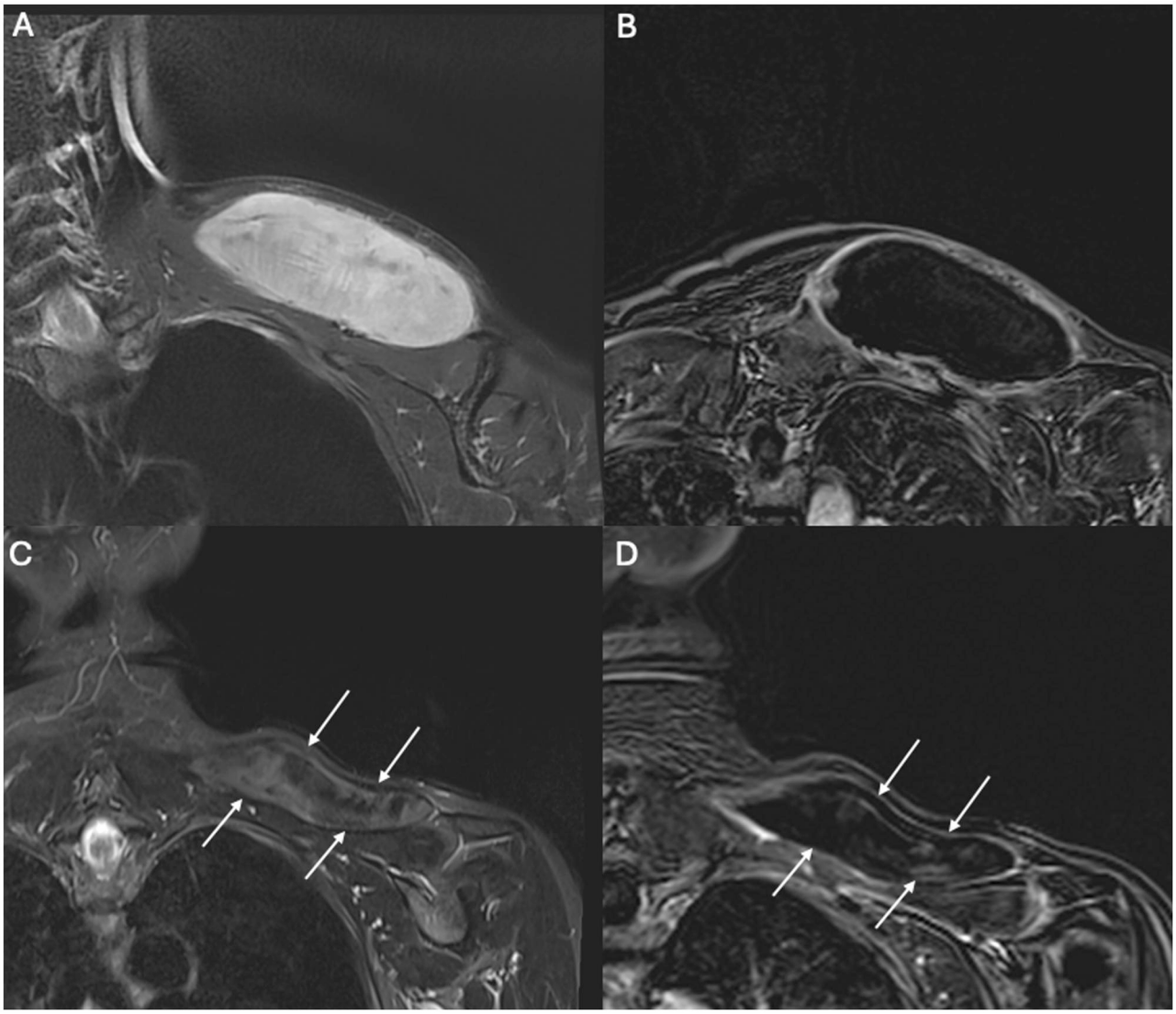

Figure 2. CA of a DF in the shoulder girdle. Coronal T2 Stir MRI (A) shows a 4.5X6X11.5 cm DF. Coronal contrast-enhanced MRI 6 months after CA (B) demonstrates complete necrosis of the tumour. Coronal T2 stir (C) and contrast-enhanced (D) MRI 18 months after treatment shows shrinkage and complete response. Abbreviations: CA = cryoablation; DF = desmoid fibromatosis.

85.8% with 28.6% complete response, 26.2% partial response and 31% stable disease. The rate of complications was quite high, but most of them (79%) were minor and resolved with symptomatic measures. Quality of life, pain and functional status were all significantly improved by CA. Tumour size was the only the negative prognostic factor in that study.

Electrochemotherapy

Given the local trend of DF to infiltrate soft tissue and the frequent vicinity of neural structures, electrochemotherapy (ECT) may appear as a valuable option. It has been used primarily to treat superficial skin tumours but has recently been reported to be effective to ablate malignant tumours close to the spinal cord with a limited risk of iatrogenic neural injuries.[81] ECT has currently been reported in the DF literature only in a single case report.[82] More evidences may come in the near future given the new perspectives offered by this modality.

Transarterial treatments

Stand-alone embolization with particles has been reported to be successful only in one case of a small DF located in the rectus sheath.[83] All other publications reported the use of chemoembolization (TACE) as the preferred transarterial treatment, with Doxorubicin being the most frequently used chemotherapeutic agent.[84-86] Doxorubicin is effective in treating DF, but its systemic use is not recommended given the associated cardiac toxicity.[40] Optimizing targeted drug delivery while minimizing systemic exposure gives the rationale for the use of TACE in DF. The authors used TACE as the primary IR option in case of cryoablation was not deemed feasible.[86]

Elnekave et al described 4 paediatric DF in 2018 treated with DEB-TACE, obtaining a decrease of tumour volume by 54 to 97% over a follow-up interval of 6-32 months.[84] In 2022, 2 papers looked at the results of DEB-TACE on larger cohorts of patients. Kim et al reported the outcomes of 11 extra-abdominal DF treated with chemoembolization.[86]

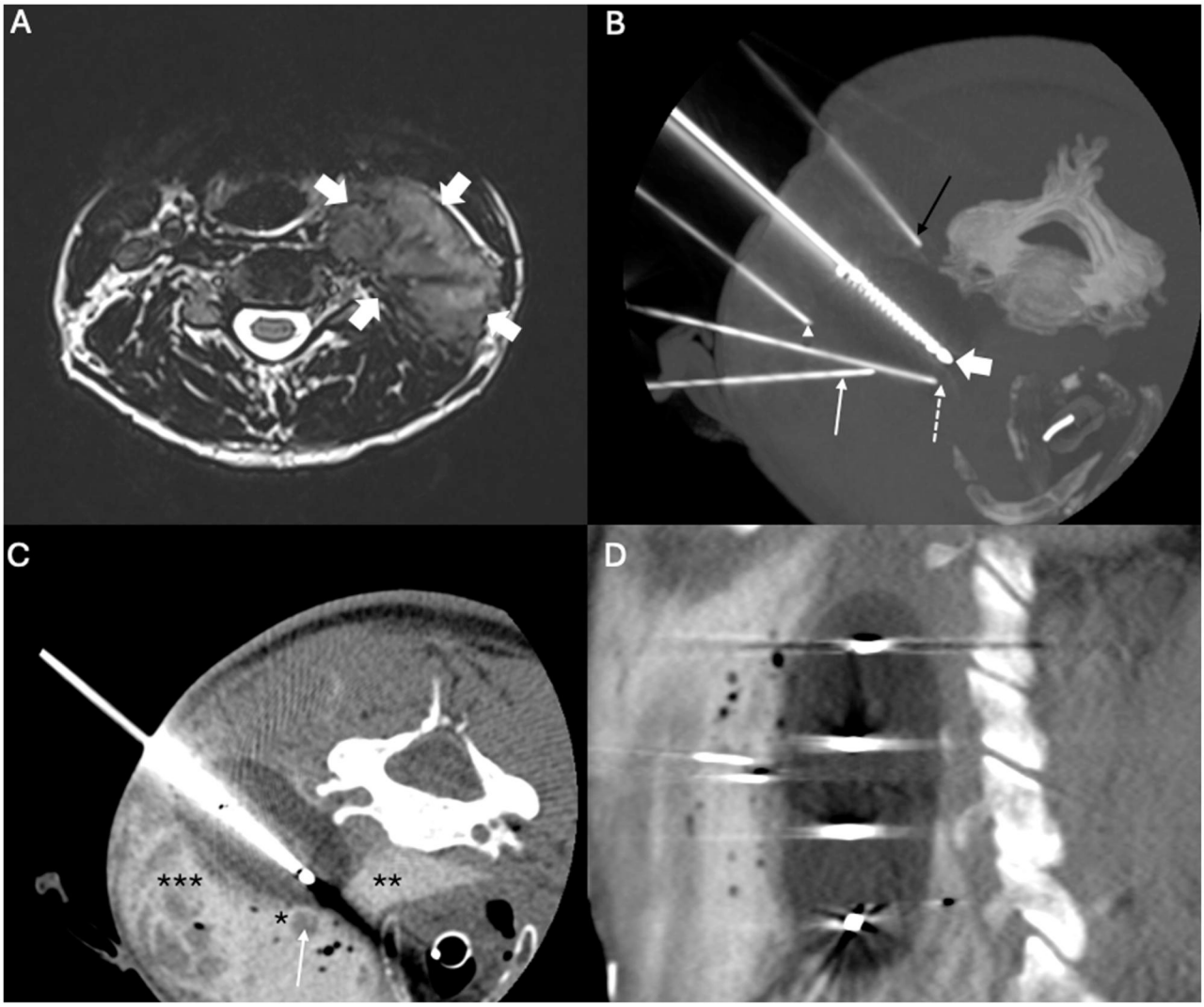

Figure 3. CA of a DF located in the neck. Axial T2 MRI (A) shows a DF located next to the pharyngeal space medially, the jugulocarotidal space anteriorly and the cervical plexus posteriorly. Axial MIP CT scan (B) shows a cryoprobe (large arrow) in the tumour. Four 22G spinal needles are inserted around the DF to dissect the C5 nerve root (black arrow), the sternocleidomastoidien muscle (arrowhead), the jugulocarotidal space (white arrow) and the pharynx (dotted white arrow). Axial (C) and oblique sagittal (D) CT scan visualizes the hypodense iceball. Note the hydrodissection of the parapharyngeal space (double asterisk), the muscle (triple asterisk) and the jugulocarotidal space (single asterisk) with the carotid artery (arrow). Despite extensive hydrodissection and neurophysiological monitoring of the C4 and C5 nerve roots (not shown), the patient suffered from laryngeal nerve palsy (unintended freezing of the vagal nerve), Claude-Bernard-Horner syndrome and C5 palsy. Symptoms partially resolved at 1-year follow-up. Abbreviations: CA = cryoablation; DF = desmoid fibromatosis.

At 1 month, partial to near-complete tumour necrosis was noticed. Tumour shrank by 18.1% at 1 month and 38.1% at last follow-up (median follow-up: 155 days). Pain reduction was also significant with a drop in pain scores by 2.6 at the last follow-up. Self-resolving skin changes were usually self-resolving.[86] Elnekave et al published the results of DEB-TACE in 24 patients, including 7 patients without prior treatments.[85] At a median follow-up of 8 months, tumour volume decreased by 59% and the disease control rate was 91%. One major complication (spine cord injury) occurred.

What is the current gold standard among the different IR modalities of treatment?

CA and HIFU are the 2 most described techniques to ablate DF, with CA being the most reported one. CA carries the same advantages as other locations, that is principally real-time visualization of the iceball and simultaneous activation of several probes allowing to create large and nonspherical ablation zone.[73] There is currently no prospective comparative study investigating the potential superiority of one modality over the other.[87] A meta-analysis issued in 2023 looked at potential differences between CA, HIFU and MWA to treat DF.[87] In the real-life practice, CA is the first IR option to treat DF. Compared to HIFU, it is more available worldwide and allows to treat larger lesions in a single session. Contraindications to CA and HIFU seem roughly similar as they are both thermally mediated modalities. CA should ideally be performed with anesthesiological support, cross-sectional image guidance, and the use of ancillary protective measures whenever needed (Figures 4 and 5). Complete coverage of the tumour with 0.5 to 1 cm safety margins (A0 ablation) should be the goal whenever technically possible. Postprocedural care including symptomatic treatment and hydration should be very strict, especially for

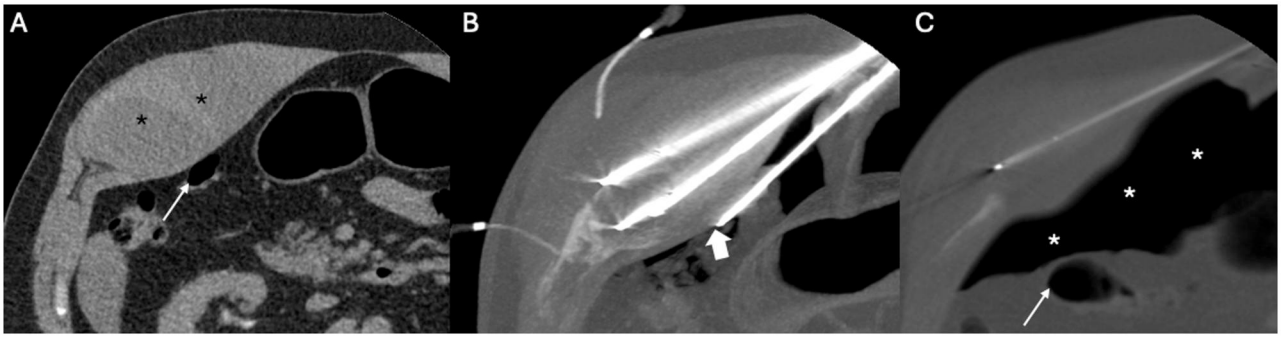

Figure 4. CA of a DF in the abdominal wall. Axial CT scan (A) shows the DF (black asterisks) with the colon (arrow) located just next to it. Following insertion of the cryoprobes, a blunt-tip needle with side hole (large arrow in B) is inserted in the peritoneal cavity. Injection of CO_2 creates a pneumoperitoneum (asterisks in C) that displace and insulate the colon (arrow) during freezing. Abbreviations: CA = cryoablation; DF = desmoid fibromatosis.

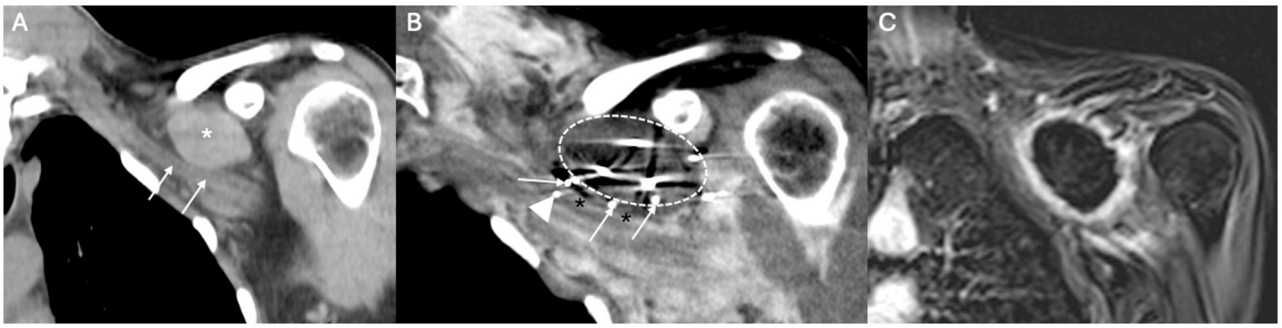

Figure 5. CA of an infraclavicular DF. Coronal CT scan (A) shows a DF (asterisk) located just above the brachial plexus (white arrows). To reduce the risk of nerve injury, hydrodissection and nerve stimulation were performed while freezing. Coronal CT scan (B) demonstrates the hypodense iceball (dotted circle), with 3 needles (white arrows) to perform hydrodissection which intervenes between the tumour and the brachial plexus (black asterisks). Freezing was performed with continuous injection of saline on all 3 needles and nerve stimulation (arrowhead). One-month follow-up contrast-enhanced MRI (C) shows devascularization of the tumour. Apart from partial axillary nerve palsy, the patient did not suffer from major neural injury. Abbreviations: CA = cryoablation; DF = desmoid fibromatosis.

large tumours.[88,89] TACE may represent a valuable local option when CA is deemed too dangerous, but more evidences are needed.[86] Following ablation, the patient should be followed up clinically and radiologically using contrast-enhanced MRI (Figure 6).

Treatment algorithm of DF in 2024

What are the recommendations?

The Desmoid Tumor Working Group issued in 2020 a proposal for the management of DF for children and adults.[13,17] An initial period of active surveillance of 1-2 years is advocated following diagnosis. Decision of treatment should be made in case of a progression which is defined, if clinically acceptable, by 2-3 subsequent tumour growths within a period of a minimum of 1 year. The rationale for this approach is to avoid overtreatment of a tumour that could potentially stabilize or even decrease in size spontaneously. If treatment is needed, choice should be made between medical therapy and local treatment depending on how complex and morbid the latter is expected to be.

Very recently (April 2024), the National Comprehensive Cancer Network (NCCN) has updated its guidelines on soft tissue sarcomas with a dedicated section on DF.[90] These guidelines emphasize one more time on the need for documented progression before treatment, except only if there are significant clinical symptoms or concerns for morbidity. Should it be required, the choice of active therapy then depends upon the location of the target tumour. For intra-abdominal and retroperitoneal DF, the options include systemic therapy and surgery if the tumour is deemed resectable. For all other sites, the options include systemic therapy, ablation, embolization, definitive radiotherapy, and surgery if the tumour is deemed resectable.

So, when should the IR raise the hand to propose ablation in tumour board?

Even though CA is mentioned as a third-line option in the algorithm of the Desmoid Tumor Working Group under the term ‘investigational treatments’, IR is more and more considered as the first local option to treat a DF if technically possible. CA provides similar results to surgery with a lower morbidity, lower costs, and the possibility to reablate.[91-93] In their practice guidelines for soft tissue and visceral sarcomas issued in 2021, Gronchi et al clearly mentioned CA as the local option for the treatment of DF.[23] Based on the results of observational studies, CA can therefore be considered as the first local option to treat DF.

When treatment is required, the real question is to decide towards medical therapy or CA. In their 2020 guidelines, the Desmoid Tumor Working Group recommended surgery as first-line therapy provided morbidity is limited. If incomplete resection is anticipated, other management than surgery should be preferred.[17] In the absence of prospective data

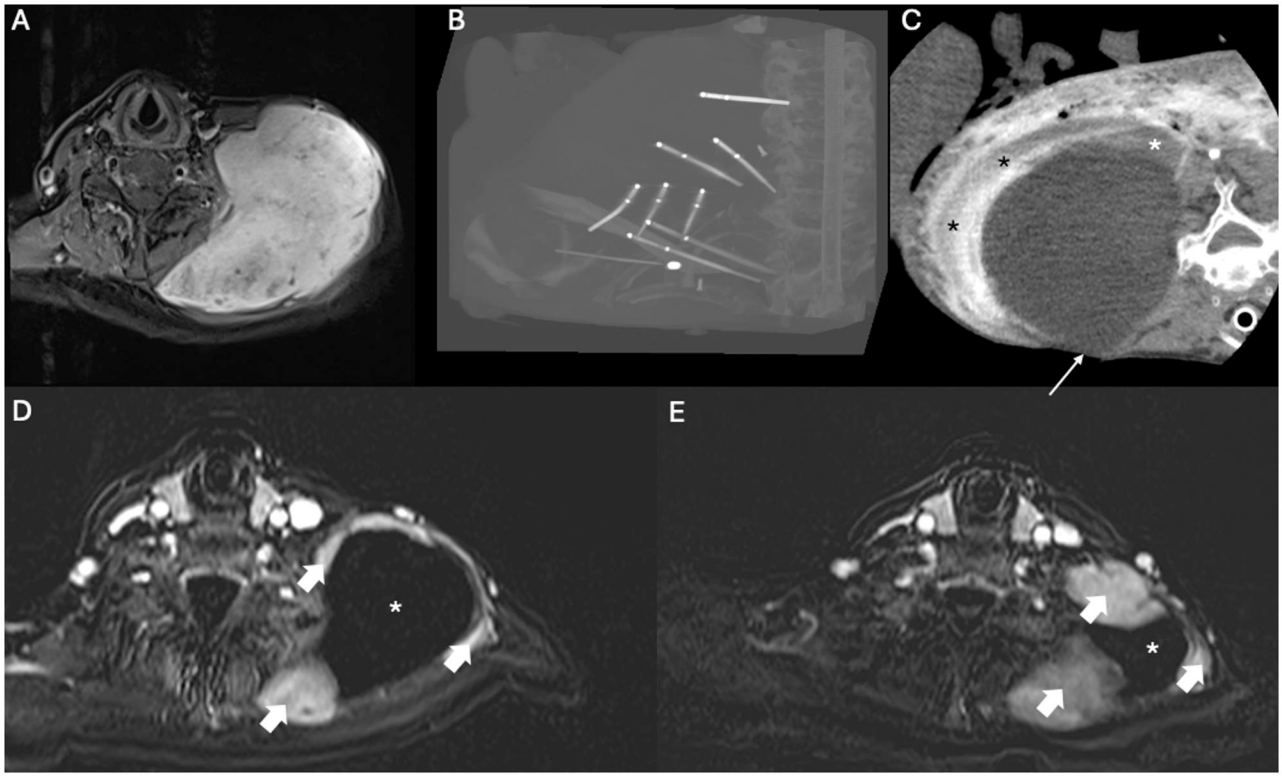

Figure 6. CA of a large DF in the neck. Axial contrast-enhanced MRI (A) shows a 11-cm tumour. Treatment was made with 8 cryoprobes (B). Final axial CT scan (C) shows the hypodense iceball with some unablated tumour (white asterisk). Note the hydrodissection of the skin (black asterisks) which fails to separate the skin anteriorly with a focal contact of the ice with the skin (arrow). 6 months (D) and 18 months (E) contrast-enhanced MRI shows the necrosis (asterisk) which shrinks progressively. Nodular enhancement is seen in the periphery of the cryoscar (large arrows) with progressive enlargement. This finding is usual following CA of a DF. In the absence of pain, the patient was simply followed without any treatment. Skin fistula occurred at the level of skin freezing, with chronic effusion still persistent at last follow-up. Abbreviations: CA = cryoablation; DF = desmoid fibromatosis.

comparing CA to medical therapy, same principles should apply for the IR. In the event of a DF that seems ablatable completely without a high expected risk of complications (typically DF in the abdominal wall, chest wall, girdles), CA may be proposed as a first-line treatment. To provide more robust data, the CRYODESMO-02 trial has started to enrol patients. This prospective randomized controlled trial seeks to compare CA with the intent of complete ablation to systemic therapy as the first-line treatment for patients with symptomatic or locally evolving DF. Hopefully, the results of this study will help to clarify the position of CA in the treatment algorithm of extra-abdominal DF. Other indications of ablation may be debulking CA, that is, intentional subtotal ablation if medical therapy fails or is not tolerated and the tumour is not too large and not growing fast close to life-threatening structures, or adjuvant CA in case of macroscopic residual disease after surgery.[17,90] Intra-abdominal should be considered a contra-indication to CA.

Conclusion

The comprehension of the disease has led to a shift in the paradigm of treatment of DF. If treatment is required, the decision is made between systemic therapy and local treatment. The interventional radiologist has a crucial role in the decision-making, as cryoablation may be one of the best fist-line options if it is technically feasible. Final decision needs of course to be made in accordance with the patient preferences, goals, and concerns.

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Conflicts of interest

None declared.

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