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CORR Insights®: Is MR-guided High-intensity Focused Ultrasound a Feasible Treatment Modality for Desmoid Tumors?

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Where Are We Now?

MR-guided focused ultrasound (MRgFUS) is an emerging mode of therapy for benign and malignant neoplastic processes in such organs as the uterus, breast, liver, and prostate [6]. With

respect to musculoskeletal tumors, MRgFUS has been used for palliative treatment of metastases to bone [2], as well as for primary treatment of osteoid osteomas [1]. However, very little has been reported on its use on soft tissue tumors including desmoids.

In the current study, Avedian and colleagues first assessed the feasibility of MRgFUS of simulated tumors in four cadaver extremities, which achieved ablation accuracies of 3 mm to 8 mm. Five patients with desmoid tumors (four involving the lower extremities and one of the chest wall) underwent MRgFUS and were prospectively followed with serial MRIs for at least 12 months to monitor for tumor regression and any complications.

The tumor volume of the desmoids became smaller in four patients and larger in one patient, with an overall mean decrease in size of 36%. Complications were minor and included

transient pancreatitis, partial peroneal nerve palsy, and skin changes such as blisters. The authors conclude that MRgFUS may be a useful treatment strategy for extra-abdominal desmoid tumors.

Where Do We Need To Go?

Although the study population was small, Avedian and colleagues were able to demonstrate the feasibility of MRgFUS in decreasing the size of the tumor in the majority of the patients during the short-to-intermediate followup period with only minor adverse effects. We should regard the results with cautious optimism, with the acknowledgement that there still are many questions that require answers.

Because the patients were not followed for longer than 12 months, the clinical importance of average reduction in tumor size of 36% remains unclear. Due to the aggressive and often unpredictable behavior of desmoid tumors, the presence of a residual tumor implies high-risk of eventual progression. It is imperative that these

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patients continue to be monitored and their long-term outcome be reported.

It is also important to note the heterogeneity of the patient cohort; a larger cohort study controlling for tumor size, type of previous treatment, and proximity to vital neurovascular structures should provide better insight about the efficacy of MRgFUS.

The patients enrolled in the current study met specific inclusion criteria—morbidity of surgery being considered unacceptable; failure of chemotherapy, surgery, and/or radiation; patient refusal of standard treatment; and the tumor being a safe target by MRgFUS. Therefore, surgical resection is still the appropriate treatment if it can be performed with likely negative margins and with little morbidity [5]. Further studies are necessary to investigate the role of MRgFUS in patients who are also candidates for surgical resection.

How Do We Get There?

Because of the relative rarity of desmoid tumors, a prospective study with

a large enough patient cohort to yield meaningful data may require involvement of multiple study centers. The authors erred on the side of undertreatment in order to maximize patient safety; as interventionalists gain more experience performing MRgFUS, their selectivity at ablating tumor tissue while preserving unaffected tissue would likely improve. This, together with higher accuracy due to technological advancements such as increase in the number of phased transducer array elements [3] and improved beam distortion correction [4], may eventually allow the use of MRgFUS for curative intent. If future studies confirm the efficacy and safety of MRgFUS, a multicenter randomized controlled trial comparing it to surgical resection may be warranted.

References

1. Geiger D, Napoli A, Conchiglia A, Gregori LM, Arrigoni F, Bazzocchi A, Busacca M, Moreschini O, Mastantuono M, Albisinni U, Masciocchi C, Catalano C. MR-guided focused ultrasound (MRgFUS) ablation for the treatment of nonspinal osteoid osteoma. *J Bone Joint Surg Am.* 2014; 96:743–751.
2. Gianfelice D, Gupta C, Kucharczyk W, Bret P, Havill D, Clemons M. Palliative treatment of painful bone metastases with MR imaging-guided focused ultrasound. *Radiology.* 2008; 249:355–363.
3. Jolesz FA, McDannold N. Current status and future potential of MRI-guided focused ultrasound surgery. *J Magn Reson Imaging.* 2008;27:391–399.
4. Liu HL, McDannold N, Hynynen K. Focal beam distortion and treatment planning in abdominal focused ultrasound surgery. *Med Phys.* 2005;32: 1270–1280.
5. Mullen JT, DeLaney TF, Kobayashi WK, Szymonifka J, Yeap BY, Chen YL, Rosenberg AE, Harmon DC, Choy E, Yoon SS, Raskin KA, Nielsen GP, Hornicek FJ. Desmoid tumor: Analysis of prognostic factors and outcomes in a surgical series. *Ann Surg Oncol.* 2012;19:4028–4035.
6. Tempany CMC, McDannold NJ, Hynynen K, Jolesz FA. Focused ultrasound surgery in oncology: Overview and principles. *Radiology.* 2011;259:39–56.