

Regional Patterns of Fluid and Fat Accumulation in Patients with Lower Extremity

Lymphedema Using Magnetic Resonance Angiography

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Running Title: Our Experience in Grading Fluid and Fat Accumulation in Patients with Lower Extremity Lymphedema Using Magnetic Resonance

Sir:

We read with interest the article entitled “Regional Patterns of Fluid and Fat Accumulation in Patients with Lower Extremity Lymphedema Using Magnetic Resonance Angiography,” by Dayan et al¹.

They are to be congratulated for their work examining fluid and fat distribution in patients affected by primary or secondary lower extremity lymphedema (LE) on magnetic resonance (MR). Even if the acquisition parameters were not provided, the protocol included postcontrast T1-weighted sequences without fat saturation, showed in the figures. However, to best highlight the fluid infiltration that characterizes LE, heavily T2-weighted sequence with a long TR/TE^{2,3} and STIR sequences⁴ were successfully used in the analysis of LE and lymphatic vessels^{2,3}.

Therefore, we applied the scoring for fluid and fat accumulation proposed by the authors¹ to 50 patients (25 females; 25 males; age range: 35-77 years; mean age: 62±11 years) affected by secondary LE of the lower limb, [post-lymphadenectomy related to prostatic cancer (n=20, 40%), endometrial cancer (n=14, 28%), cervical cancer (n= 9, 18%), melanoma (n= 4, 8%), and lymphoma (n=3, 6%)], from our LE case series, who were studied with Non-Contrast MR Lymphography, including a 3D STIR sequence (TR 3000 ms, TE 254 ms, TI 160 m, FOV 460 x 504 mm; matrix 315 x 384 pixel, slice thickness 1 mm), that was employed for the analysis (Figure 1).

As 24 (48%) of our patients showed bilateral LE (figure 2), the scoring for fat accumulation was applicable only in 26.

Imaging evaluation was based on visual assessment and was performed by 2 independent readers (radiologists experienced in LE); the inter-reader agreement was estimated with Light’s kappa (κ) with 95% Confidence Interval using SPSS 20 (IBM, Chicago, IL).

In our MRs, all patients showed fluid accumulation (100%); interobserver agreement was perfect in its grading, with Light’s $k=1$.

Most patients showed some degree of fat accumulation (40, 80%), but most frequently located in the thigh (30/40; 75%).

For fat grading, Light's k was 0.765, 95% Confidence Interval, 0.521-0.941, slightly inferior to that reported in the study by Dayan et al¹. The different results can be explained by the lower number of cases included in our analysis and by the fact that our assessment was based on visual assessment: in the reference study¹ it was not specified if measurements were made between the affected and unaffected limbs.

In conclusion, we observed that fluid accumulation grading showed excellent reproducibility, higher in STIR sequences aimed at highlighting fluids.

In grading of fat accumulation, the main limitation of the proposed scoring, highlighted by our experience, was related to the non-applicability in patients affected by bilateral LE, 48% in our case series.

The study by Sen et al⁵ proposed a new threshold-based level set segmentation technique to differentiate fat, muscle, and lymph fluid on MR in LE patients. This method needs to be validated by further studies but could represent a useful tool in the selection of eligible liposuction candidates and follow-up of LE patients.

Again, we congratulate Dr. Dayan et al for their study and striving to optimize imaging assessment of patients affected by LE.

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Figure Legends

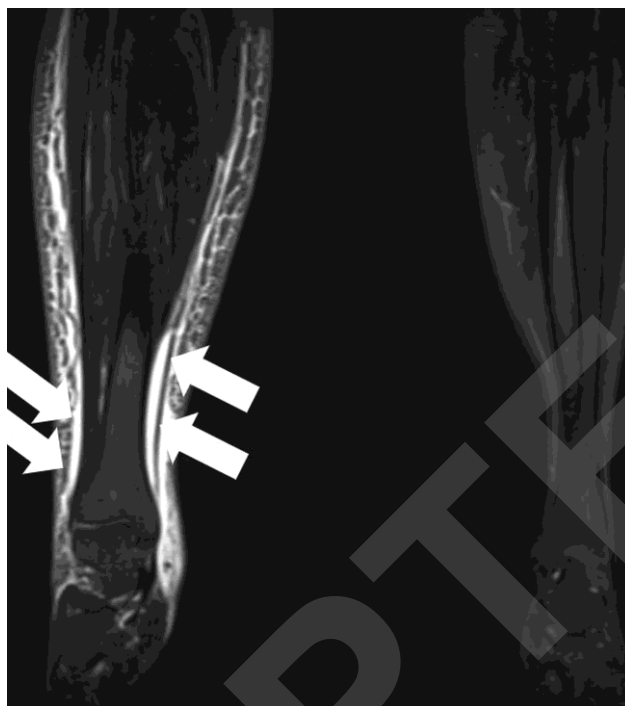
Figure 1

Coronal STIR showing the legs of a female patient who developed LE, after lymphadenectomy for cervical cancer. According to the article by Dayan et al. ¹, the patient was graded as fluid 2/fat 0. White arrows show deep lymph accumulation in the epifascial compartment, without significant fat accumulation. The contiguous fluid stripe along the lateral leg is consistent with fluid grade 2.

Figure 2

Composing function of STIR sequences acquired in a female patient submitted to lymphadenectomy for uterine cancer. The LE was bilateral, with evidence of continuous fluid stripes on both sides (white arrows). Bilateral honeycomb pattern was also present (black arrows), with enlargement of the subcutaneous fat. The affection of both limbs prevents the application of the classification relating to the accumulation of fat.

Figure 1



ACCEPTED

Figure 2

