Assesment of the fat content of proximal femur and adjacent muscle in patients with osteoarthritis

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Introduction

Osteoarthritis (OA) affects about 10% of the population but little is known about its pathogenesis. OA has traditionally been thought of as a disease that erodes cartilage. Recently it has been proposed that OA may be a systemic disorder with many precursors to the manifestation of arthritic symptoms. One such precursor may be an altered lipid metabolism and changes in the regulation of cells that form the skeletal tissues [1]. Studies have demonstrated an increased fat content in cancellous bone [2] and a greater concentration of fatty acids in cartilage of OA patients [3]. In this pilot study, we have used MRI to investigate the lipid concentration in muscular tissue proximal to the pelvis in patients with OA and in normal volunteers.

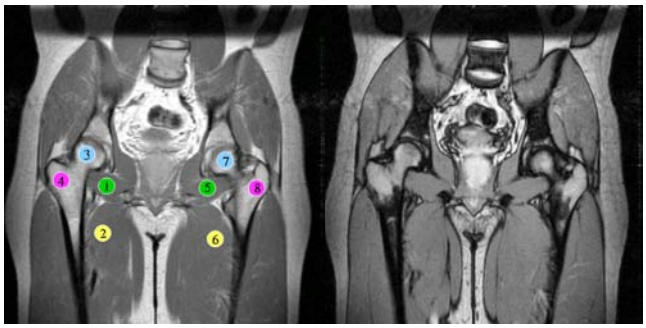

Figure 1. On the left a D_s image (fat and water in phase) on the right a D_d image (fat and water out of phase). The coloured circles represent the locations of the eight ROI used: Obturator externus (1 and 5), quadriceps (2 and 6), femoral head (3 and 7) and trochanter (4 and 8).

Methods

16 patients (aged 56-81) that were admitted for total hip replacement and 11 healthy volunteers (aged 21-49) were recruited for the study. Using a Siemens 0.95T Magnetom scanner, multislice coronal images of the pelvis were acquired using the Dixon 2-point technique [4]. Two image volumes were acquired: 1. With fat and water in phase (D_s), 2. With fat and water out of phase (D_d). Image analysis software was developed using IDL (RSI Boulder, CO). Eight regions of interest (ROI) were drawn on the left and right sides on the femoral head, the trochanter, the obturator externus and the quadriceps (shown in Figure 1). Lipid percentage values were calculated from the signal intensity in each ROI values using Eq.1

$$\%lipid = \frac{1}{2}\frac{D_s - D_d}{D_s} \times 100 \qquad \text{Eq. 1}$$

Results

	Patient (% lipid)		Volunteer (% lipid)	
	Right	Left	Right	Left
Quadriceps	10.3 ± 5.4	10.8 ± 5.4	2.8 ± 1.8	4.6 ± 2.7
Obturator externus	7.3 ± 4.0	9.2 ± 7.1	1.0 ± 1.1	1.3 ± 2.4
Femoral head	26.4 ± 6.9	19.6 ± 3.8	22.7 ± 6.9	21.6 ± 6.3
Trochanter	18.2 ± 5.2	18.6 ± 4.1	22.1 ± 9.5	23.3 ± 11.1

Table 1. Percentage lipid concentration in each region averaged over both groups.

Student t-test p values calculated between patient and volunteer for muscle and bone data are 0.0008 and 0.4 respectively. No significant difference was noted between the right and left sides.

Discussion

This pilot study has shown a significant difference in muscle lipid content between OA patients and healthy volunteers. This difference supports the argument that an altered lipid metabolism may be a precursor to arthritis. No significant difference was seen in the femoral head, this is probably due to the image quality in this region. Further work is required to determine if these results are a factor of the age difference between the two groups.

References

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