



## ■ RESEARCH

# Possible association of single nucleotide polymorphisms in the 3' untranslated region of HOXB9 with acetabular overcoverage

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## Objectives

Excessive acetabular coverage is the most common cause of pincer-type femoroacetabular impingement. To date, an association between acetabular over-coverage and genetic variations has not been studied. In this study we investigated the association between single nucleotide polymorphisms (SNPs) of paralogous Homeobox (HOX)9 genes and acetabular coverage in Japanese individuals to identify a possible genetic variation associated with acetabular over-coverage.

## Methods

We investigated 19 total SNPs in the four HOX9 paralogs, then focused in detail on seven of those located in the 3' untranslated region of *HOXB9* (rs8844, rs3826541, rs3826540, rs7405887, rs2303485, rs2303486, rs79931349) using a case-control association study. The seven *HOXB9* SNPs were genotyped in 316 subjects who had all undergone radiological examination. The association study was performed by both single-locus and haplotype-based analyses.

## Results

The genotype and allele frequencies of the five *HOXB9* SNPs showed significant association with acetabular over-coverage compared with controls (rs7405887 OR = 3.16,  $p = 5.29 \times 10^{-6}$ , 95% CI 1.91 to 5.25). A significant difference was also detected when haplotypes were evaluated (OR = 2.59,  $p = 2.61 \times 10^{-5}$ , 95% CI 1.65 to 4.08). The two *HOXB9* SNPs (rs2303485, rs2303486) were associated with decreased acetabular coverage (rs2303485 OR = 0.524,  $p = 0.0091$ , 95% CI 0.322 to 0.855; rs2303486 OR = 0.519,  $p = 0.011$ , 95% CI 0.312 to 0.865).

## Conclusions

The five *HOXB9* SNPs (rs8844, rs3826541, rs3826540, rs7405887, rs79931349) were associated with acetabular over-coverage. On the other hand, the two SNPs (rs2303485 and rs2303486) were associated with the lower acetabular coverage. The association of rs2303486 would be consistent with the previous study. Therefore, the *HOXB9* SNPs might be involved in the morphogenesis of acetabular coverage, and could be an independent risk factor for developing pincer-type femoroacetabular impingement.

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## Article focus

■ To date, an association between acetabular over-coverage and genetic variations has not been studied. We investigated the association between single nucleotide polymorphisms (SNPs) of paralogous HOX9 genes and acetabular over-coverage.

and could be an independent risk factor for developing pincer-type femoroacetabular impingement.

## Strengths and limitations

■ **Strengths:** This is the first report on the association of genetic variations in acetabular over-coverage. The *HOXB9* SNPs showed significant association with acetabular over-coverage compared with controls.

## Key messages

■ The *HOXB9* SNPs might be involved in the morphogenesis of acetabular coverage,

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