

CONCISE REPORTS

Are radiological joint space widths of normal hips asymmetrical?

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Abstract

Background—To be certain that the joint space width is abnormal in the case of hip joint pain when compared with the contralateral hip requires knowledge of physiological dissymmetry.

Aim of the study—To assess interindividual variability and dissymmetry in pelvic radiological joint space width.

Methods—Pelvic radiographs of subjects without hip joint disease. Measurement with a 0.1 mm graduated magnifying glass and 0.5 mm graduated flat ruler at the hip superointermediate site (vertical going through the femoral head centre). After randomisation of the side to measure, analysis of nine groups of 19 plain films by one investigator blind for the result of the contralateral side.

Results—The difference between the left and right hip was plotted against the corresponding mean for all 171 normal subjects. This shows the frequency and the limits of the asymmetry at each measurement site. The asymmetry is independent of interindividual variability of the joint space width and greater than the measurement error in most subjects.

Conclusion—This study confirms the interindividual variability of hip joint space width, shows the frequency of hip joint space asymmetry and defines its limit.

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The interindividual differences in hip joint space width (JSW) on pelvic anteroposterior (AP) view radiographs in normal subjects have been assessed^{1 2} but the intraindividual differences between both hip joints have not. Nevertheless, when hip joint involvement is suspected, the contralateral hip JSW on an AP view is generally considered one of the most reliable references. The aim of this study was primarily to assess the intraindividual differences in the width of the right and left hip joint spaces on pelvic AP views in subjects without hip joint disease or symptoms. Interindividual variations and the influence of sex, age, weight, height, and of the dominant side on hip joint width in normal subjects were also studied.

Methods

STUDY DESIGN

Front view radiographs were obtained from patients seen between 1992 and 1995 in the rheumatology department for diseases requiring pelvic radiographs but not affecting the hip joints. Painless hip joints were considered normal by the radiology department (Stage 0 of Kellgren and Lawrence)³: neuralgia 46, multiple myeloma 36, femoropatellar pain 2, prostate cancer 1, breast cancer 1, depression 2, isolated fever 1, pyramidal syndrome 1.

Front view radiographs were also obtained from unaffected members of a spondylarthropathy family study including a questionnaire to identify those without rheumatic symptoms including hip joints and an AP pelvic view after informed consent.

For each subject, sex, weight, height, age, and dominant side were recorded.

JSW measurements were as follows. The centre of femoral head was determined with concentric circles engraved on a transparent device. Measurement was done by one investigator on three sites (fig 1): (1) superointermediate (SI) on the vertical line joining the femoral head centre. (2) Superolateral (SL) on the line joining the femoral head centre to the external limit of the cotyle roof. (3) Superomedial (SM) on the line joining the femoral head centre to the internal limit of the cotyle roof.

MEASUREMENT METHODS

JSW was measured on a horizontal view box with (a) a transparent ruler with 0.5 mm graduation; (b) a graduated magnifying glass with 0.1 mm graduation.

Radiographs were randomised into nine groups of 19 films. Patient identity was hidden. The right hip of one group was measured then left hip of another group and so on.

The investigator was not aware of the measurement of the opposite hip or of the measurement done with the other instrument.

The randomisation code was broken after the completion of all measurements.

STATISTICAL ANALYSIS

For all measures, the graphical approach described by Bland and Altman was applied.⁴ This method focuses on differences between pairs of measurement of the same quantity against their corresponding mean. Graphs were

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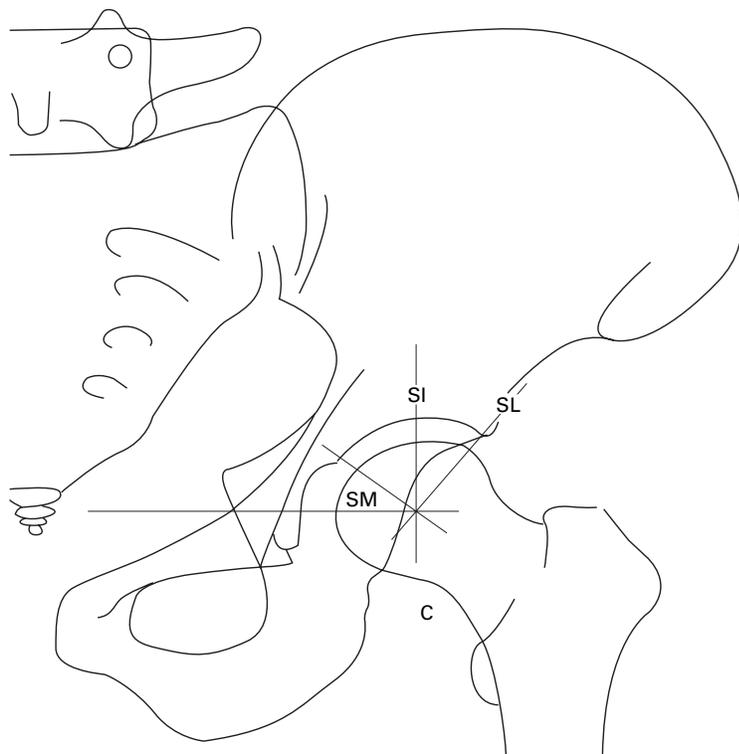


Figure 1 Measurement site definition: superointermediate (SI) is determined by the vertical going through the femoral head centre (C); superolateral (SL) by a line joining C and the external limit of the cotyle roof; superomedial (SM) by a line joining C and the internal limit of the cotyle roof.

plotted for each measuring instrument and site

Table 1 Hip joint space width (JSW) measurement with a 0.1 mm graduated magnifying glass*

Measurement site*	Mean ± limits of agreement between two measurements of the same hip	Mean ± limits of agreements between right and left hips	Asymmetrical hip JSW%†	Greatest difference (mm)
Superointermediate	0.04±0.13	-0.03±0.61	56	0.7
Superolateral	0.10±0.18	+0.08±0.78	66	1.2
Superomedial	0.15±0.22	+0.01±0.67	54	0.9

*See Methods for measurement site definition. †Percentage of people in whom the difference between the two hip JSW is greater than the within expected intraobserver variation.

Table 2 Hip joint space width (JSW) measurement with a 0.5 mm graduated flat ruler*

Measurement site*	Mean ± limits of agreement between two measurements of the same hip	Mean ± limits of agreements between right and left hips	Asymmetrical hip JSW%†	Greatest difference (mm)
Superointermediate	0.01±0.27	+0.05±0.33	9	0.5
Superolateral	0.01±0.23	+0.02±0.60	40	1.0
Superomedial	0.02±0.40	+0.05±0.57	18	0.7

*See Methods for measurement site definition. †Percentage of people in whom the difference between the two hip JSW is greater than the within expected intraobserver variation.

Table 3 Normal hip joint space width according to sex

Measurement site	With a magnifying glass (mm)*		
	Total population	Women	Men
Superointermediate	4.33 (0.76) (2.2-7.5)	4.21 (0.68) (3.0-7.5)	4.49 (0.83) (2.2-7.4)
Superolateral	4.74 (0.77) (2.6-7.0)	4.57 (0.69) (2.6-6.5)	4.96 (0.81) (2.8-7.0)
Superomedial	3.88 (0.75) (2.3-6.8)	3.81 (0.67) (2.3-6.3)	3.99 (0.81) (2.4-6.8)

*Values are mean (SD) and (range).

of measurement. Limits of agreement were estimated as d mean (2SD), where d mean is the mean difference and SD, the standard deviation of the difference.⁴ Thirty pelvic films (60 joints) were also measured twice, once at the beginning and once at the end of the study by the investigator who made all the measurements. These 60 pairs were used to calculate the limit of agreement between two measurements.^{5,6}

The extent to which right and left difference are greater than the within expected intraobserver variation permitted us to define the percentage of asymmetrical hips at each measurement site and the greatest difference between right and left hips at the different level.

The significance of correlation between the differences in JSW and several demographic data such as age, weight, and height were assessed by Pearson's correlation coefficient.

Results

Ninety films were obtained from patients observed from 1992 to 1995 and 81 from the unaffected members of the spondylarthropathy family study. Among these 171 persons, 98 were female (57.3%); their mean (SD) age was 50.2 (18.4) years without a statistically significant difference between sexes (48.7 (19.3) years for women and 52.3 (16.9) for men ($p=0.188$)).

Limits of agreement between right and left JSW were at the superointermediate level -0.03 (0.61) with graduated magnifying glass and 0.02 (0.60) with flat ruler (results at other site measurements are shown in tables 1 and 2. Interindividual differences in hip JSW were confirmed at the three measurement sites. For the superointermediate joint space, the mean width was 4.33 mm and the range 2.2 to 7.7 mm. Other results are shown on table 3.

Intraindividual differences between left and right hip JSW at the superointermediate site are shown in fig 2A for measurements done with the graduated magnifying glass. Differences greater than the measurement error (0.18 mm) were observed in 56% of the subjects; 95% of these differences were less than 0.6 mm and the greatest difference was 0.7 mm.

At the same level, using the flat ruler (fig 2B), 9% of the differences were 0.30 mm or more and the greatest difference was 0.5 mm (fig 3). As shown in figure 2A and B the difference between the right and left hips are independent of a normal JSW.

For superointermediate site and measurement with a magnifying glass, differences between both hips are (mean (2SD) (range)) 0.03 (0.61) (0.0-0.7 mm). Results obtained at the other measurement sites are shown in tables 1 and 2.

INFLUENCE OF AGE, WEIGHT, HEIGHT, SEX, AND DOMINANT SIDE ON HIP JSW

Normal hip JSW is greater in men than in women for each measurement site and measurement technique (table 3). For each sex, no statistically significant correlation was observed between age, weight, height or domi-

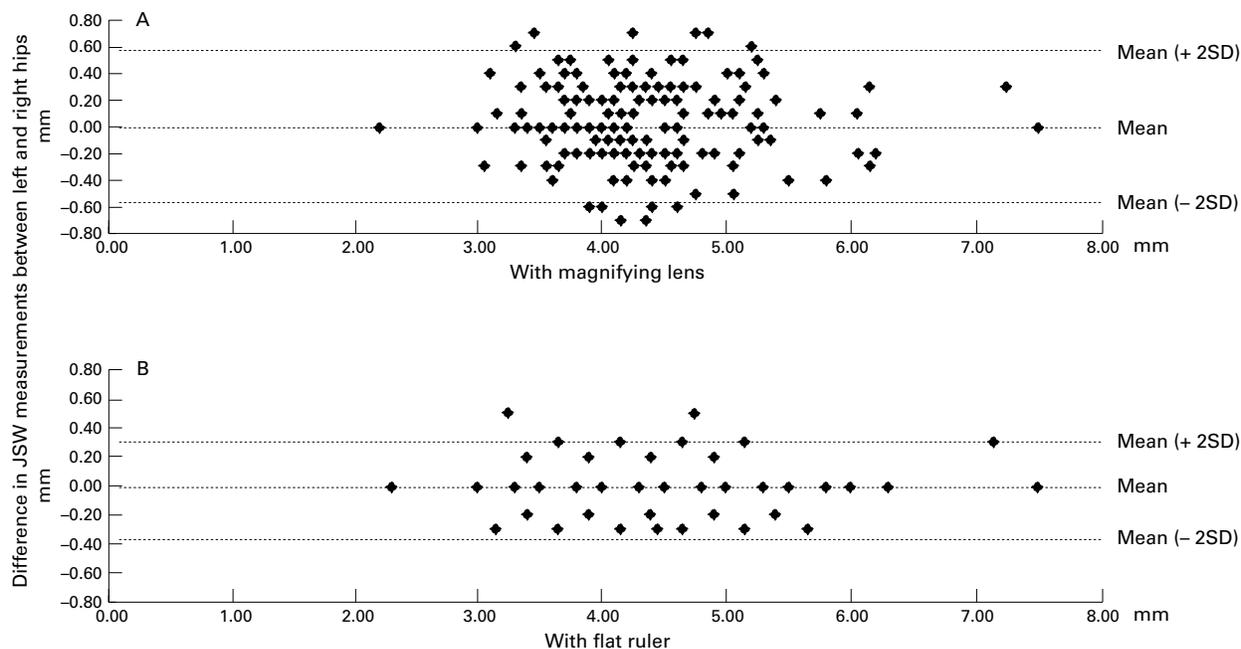


Figure 2 Superintermediate hip JSW measurement.

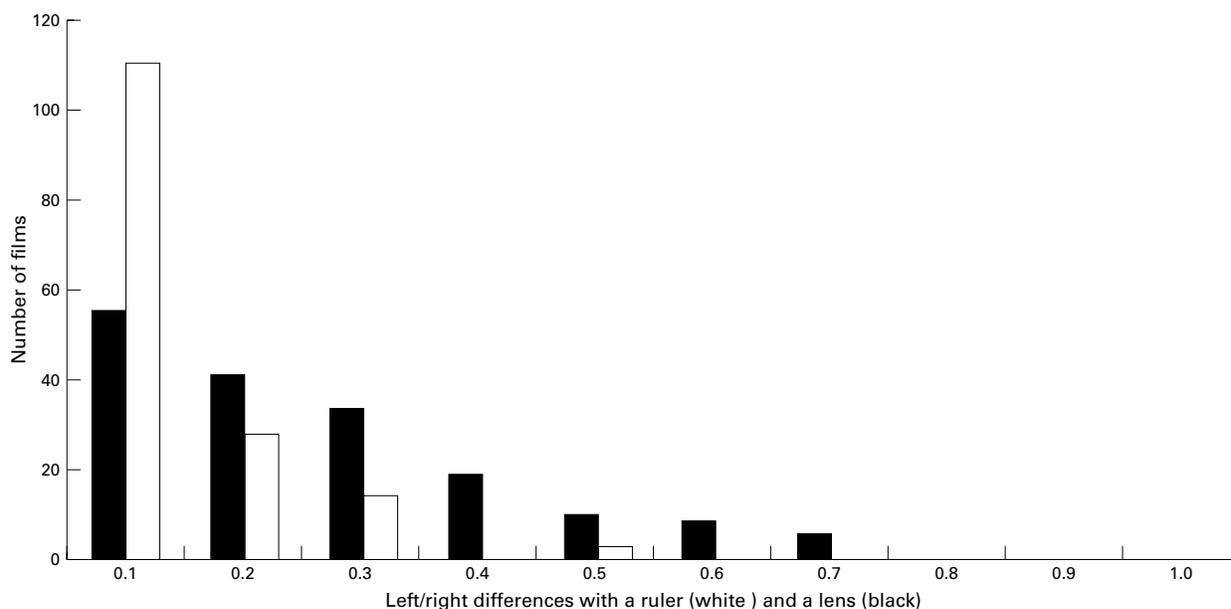


Figure 3 Hip JSW measurements at a superintermediate site. Differences under 0.3 mm are within the intraobserver variation.

nant side and the hip JSW whatever the sites or the technique of measurement. Differences observed in JSW between right and left hips were not correlated with age, weight or height whatever the site of measurement and the measuring instrument. As an example for the differences observed using the magnifying lens for measurement of superintermediate JSW, there were no significant correlation with age ($r=0.04$, $p=0.60$), weight $r=0.08$, $p=0.28$) and height ($r=0.01$, $p=0.81$). Similar results were observed inside the two subgroups of pelvic radiographs or when comparing difference between these two subgroups (patients with normal pelvic radiographs and pelvic radiographs from unaffected members of a spondylarthropathy family study).

Discussion

Hip JSW measurement is a reliable index of the presence, the severity, and the stage of a hip joint disease.¹⁻⁷ The contralateral hip is often used as the reference to assess joint space narrowing.

It was therefore of interest to quantify the frequency and the degree of the asymmetry between normal left and right hip joint spaces. The front view pelvic radiograph permits the measurement of both hip joint spaces. As the pelvic front view undertaken in the standing or lying position has no influence on normal hip JSW,⁸ either film was selected.

Despite the wide range of the normal hip JSW (2.2–7.5 mm), the difference observed between the right and left hips is independent of the JSW.

The results of this study indicate the relative frequency but also the limits of physiological asymmetry between right and left hip and show that age, height, weight, and dominant side have no influence on this physiological asymmetry.

The greatest difference observed between the normal hips in one person was less than 0.7 mm at the superointermediate site, less than 1.0 mm at the superolateral site, and less than 0.9 at the superomedial site. These differences could be considered as physiological unless asymptomatic hip joint diseases exist.

In the presence or even in the absence of hip pain, a difference greater than one of these physiological differences between left and right hip strongly suggests a pathological joint space narrowing.

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