

How to take and read hip joint radiographs in a structured way

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Prevalence of canine hip dysplasia (CHD) can be reduced by controlling dogs for CHD radiographically and selecting those with normal hip joints for breeding. Best results will be achieved when phenotypic scoring is combined with progeny testing. The quality of a dog can be expressed as breeding value.

For official CHD examination a dog must be at least 1 year of age (Europe, UK, Australia) or 2 years of age (US) respectively. Hip radiographs are taken with the dog in complete muscle relaxation, making deep sedation or anaesthesia mandatory. The dog is placed in exact dorsal recumbence, the hind limbs are extended caudally and the stifles rotated internally so that the patellae are superimposed over the femora (Fig. 1). The beam is centred over the caudal end of the pelvis so that the entire pelvis, the last lumbar vertebra and both stifles are included on the film (Fig. 2). A second projection of the pelvis with the stifles abducted is recommended but voluntary in most countries (Figure 3).

Hip joints are assessed for laxity and morphological changes of the acetabulum and proximal femur. Radiographic criteria for CHD scoring are a) degree of laxity, b) width of joint space, c) percentage of femoral head coverage, and signs of arthrosis/DJD both of the d) acetabulum and e) the femoral head and neck. Final scoring depends on the modality used in the country of examination.

As an example the Swiss scoring mode is presented (Table 1), which can be transformed into a CHD grading according to FCI (Fédération Cynologique Internationale), (Table 2). The following 6 parameters are evaluated and scored separately for each hip joint (Figure 3):

1. Norberg angle on the radiograph with the hind limbs extended
2. Position of femoral head centre (FHC) relative to dorsal acetabular edge (DAE), (degree of subluxation)
3. Shape of craniolateral acetabular edge
4. Shape and thickness of the subchondral bone of the cranial acetabular part
5. Shape of femoral head and femoral neck respectively
6. Osteophytes on the caudolateral edge of femoral neck (Morganline)

Each joint is graded separately. The joint with the higher score defines the degree of CHD for the dog. Total score is dominated by 3 parameters (parameter 1 to 3 in table 1): Norberg angle (NA), degree of subluxation, and remodelling of the cranial acetabular edge respectively.

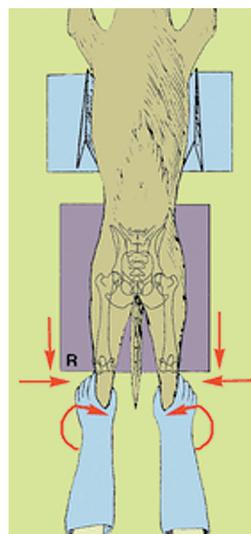


Figure 1: Schematic drawing showing how to position a dog correctly for radiographic examination for CHD (from: www.fondazione.saluteanimale.it/CENTRALE/index.html)



Figure 2: Hip joint projection with hind limbs extended and slightly pronated. The x-ray beam is centered over the caudal edge of the pelvis. The entire pelvis and both stifles are depicted. Note marker (D) indicating right side of the dog.

Figure 3: Hip joint projection with stifles abducted and the tarsi elevated approximately 25 cm off the table. The x-ray beam is centred directly over the hip joints.



Table 1. Radiographic criteria for CHD grading (The Swiss scoring mode)

Norberg Angle (JS= Joint Space)	Relation FHC/ DAE*, Width of Joint Space (JS)	Cranio-lateral Acetabular Edge (CAE)	Cranial Subchondral Acetabular Bone	Femoral Head (H), Femoral Neck (N)	Morgan-Line	Score
$\geq 105^\circ$ JS congruent	FHC medial to DAE (> 2 mm), JS narrow	parallel to femoral head	fine, even	H: round, smooth N: well demarcated	not visible	0
$\geq 105^\circ$, but JS widened slightly, or $< 105^\circ$, but JS narrow	FHC medial to DAE (1-2 mm), JS minimally divergent	horizontal on lateral 1/4	even	H: round N: poorly demarcated (cylindrical)	edged shoulder on view with stifles abducted care: smooth bump not scored.	1
$\geq 100^\circ$	FHC super-imposed on DAE, JS slightly divergent	slightly flattened, or mild exostosis	slightly thickened laterally, slightly reduced medially	H: slightly flattened N: mild exostosis	fine linear spur (up to 1 mm wide)	2
$\geq 90^\circ$	FHC lateral to DAE (1-5 mm), JS moderately divergent	moderately flattened, mild exostosis, two part surface	moderately thickened laterally, moderately reduced medially	H: moderately flattened N: mild exostosis	well defined spur (up to 3 mm wide)	3
$\geq 80^\circ$	FHC lateral to DAE (6-10 mm), JS markedly divergent	markedly flattened, moderate exostosis	markedly thickened laterally, may not be present medially.	H: moderately flattened N: moderate exostosis	broad irregular spur (> 3 mm wide)	4
$< 80^\circ$	FHC lateral to DAE (>10 mm), or Luxation	DAE absent, acetabulum markedly deformed	blending with lateral pelvic rim or absent	H: severely deformed N: massive exostosis	spur incorporated in or superimposed by general exostosis	5

* FHC= Femoral Head Centre ; DAE = Dorsal Acetabular Edge

Table 2. Grading key

Total Score of the worse Hip Joint	Degree of CHD (according to FCI)	
0 - 2	A	Normal, no evidence of CHD
3 - 6	B	Borderline
7 -12	C	Mild CHD
13 -18	D	Moderate CHD
> 18	E	Severe CHD

Score may be subdivided further and degree of CHD given as A1 (score 0), A2 (score 1-2), B1 (3-4), B2 (5-6), C1 (7-9) etc. if desired.

Caution: Total score reflects degree of CHD only approximately. Degree of CHD may be worse than indicated by score, particularly in young dogs with obvious hip joint laxity but no signs of arthrosis/arthritits (yet)! NA is the most valuable parameter as it can be measured objectively, has a wide scale of values and a high correlation and regression with the final scoring.

Figure 4: FCI grades A to E. (Taken from the website of the FSA <http://www.fondazionealutteamale.it/CENTRALE/index.html>)

