



Preface

The “Röntgenleitfaden” is now issued in its second revision. Its abbreviation is “RöLF 07”. The radiological examination of horses for purchase purposes is common and established world wide. Radiographs, as permanent documents, are commonly evaluated and interpreted by several veterinarians. Frequently, differing opinions are stated due to this circumstance. The difference of opinion has been a common cause of legal dispute. This problem was addressed by the equine board of the German “Tierärzteschaft” in 1991. The solution was the formation of a committee to provide a recommendations for quality standards of radiographs, nomenclature of findings and recommendations for interpretation of radiologic changes. The first committee was formed by the professors Ueltschi, Berne; Dik, Utrecht and Hertsch, Hanover. The chair was assigned to Prof. Hertsch. The resulting protocol of the first radiology-committee was presented to the equine board in 1993 and recommended for application via the German “Tierärzteschaft”.

Advantages of these interpretation guidelines were soon apparent; a consistent approach and evaluation of radiographs was beneficial for all participants and protected veterinarians from inappropriate expectations and demands. Differentiation into classifications made results more comprehensible to laypersons.

The first revision of the Radiology-Guidelines was presented by the second radiology-committee in 2002 (Prof. Gerhards, Munich; Prof. Hertsch, Berlin; Dr. Jahn, Bargteheide; Dr. von Saldern, Telgte). The third radiology-committee (Prof. Gerhards, Munich; Prof. Hertsch, Berlin; Dr. Jahn, Bargteheide; Dr. Brunken, Verden) is now submitting the second revision of the Radiology-Guidelines (RöLF 07) in 2007.

Many meetings of the working committee of the “Gesellschaft für Pferdemedizin (GPM)” preceded for configuration of the Radiology-Guidelines related X-Ray-CD. Suggestions from this group, from practice and adjudication influenced the revised form.

The revised form includes

1. a text-modified but not content-modified definition of the classes I to IV,
2. retention of the principle not to necessarily mention class II findings,
3. an improved differentiation of radiological findings,
4. a resulting enhancement of the number of findings from 200 to 286,
5. an improved structure and
6. that clinical findings do not play a role in the classification of radiographs, only on the final judgement of the horse as a purchase candidate

It needs to be emphasised that the allocation of findings into classes and intermediate classes is based on scientific evidence on one hand and on professional competent appreciation of the committee on the other where evidence is missing.

Many class predictions will not and cannot be backed by scientific studies; as such, legal judgements either postulated or denied as impossible. (E.g. studies on horses with a defined finding at equal shape, equal breed, equal age, equal gender and defined equal use and husbandry in a period over two to five years are demanded.)

Sincere thanks to the GPM, which enabled the development of these Radiology-Guidelines through financial support. All members of the radiology-committee and the working committee on the X-Ray-CD volunteered their valuable time for this time consuming task.

Thanks to everyone for committed, clear and dedicated discussion.

Also these Radiology-Guidelines are subject to change due to new confirmed scientific findings. Misuse and misinterpretation are reduced by this revision but not excluded.

Like their precursors, the Radiology-Guidelines 2007 are meant to be utilised by veterinarians to provide impartial expertise for the evaluation of radiographic findings for purchaser and vendor.

Prof. Dr. B. Hertsch



Röntgenleitfaden (RöLF 07)

Guidelines for the Radiological Evaluation of Horses at the Purchase Examination – Revised Version 2007

Preamble

The Radiology Guidelines are a recommendation to veterinarians for evaluation of radiological findings relevant to the animal's health on purchase examinations of horses. These guidelines are not to be applied to evaluation of lame horses, foals before the age of weaning or young horses for breeding selection. Separate basic principles must be developed for these purposes.

They are a recommendation of the "Bundestierärztekammer" (German Federal Veterinary Medical Association) based on the 2002 version by the second radiology-committee and revised by the third radiology-committee in 2007 (Prof. Dr. Gerhards, Prof. Dr. Hertsch, Dr. Jahn, Dr. Brunken). The radiological examination contains standard projections ("standard radiographs" and "advanced radiological examination"). The examination may be expanded via supplementary (altered technique in comparison to standard) and specific radiographs (defined particular views, e.g. palmaroproximal-palmarodistal oblique / skyline view of the navicular bone). Not every anatomical change is apparent when the suggested standard views are taken. Advancement or diminution of the standards is subject to agreement between client and veterinarian.

The evaluation in the guidelines refers to the described standard projections and views of the advanced radiological examination (back and stifle).

Radiological findings are categorised in classes.

All additional views are evaluated individually and are not classified.

Demands of the purchaser and the vendor, as well as the veterinarian's feasibility to evaluate the radiographs are considered equally by allocation of findings in radiological classes.

The results of clinical examination including history, age, breed and use can be incorporated into the final evaluation of the horse at a purchase examination.

An exact localisation of lameness causing pain is impossible in the framework of a purchase examination.

These guidelines are reflecting current experiences in equine practice. They should be adapted to new confirmed scientific findings if and when applicable.

Annotations concerning quality and technique

The rules of radiation protection of every person involved have to be considered at a radiological examination. That is concerning the topicality of technical qualification according to § 18 (2) Röntgenverordnung RöV (radiation protection by-law).

The instrument adjustment must produce a quality of radiograph allowing evaluation of bony structures, contours, articulation lines and soft tissue. These qualities are not always optimally achievable in the described standard views.

For documentation of radiographs (markers and labels) only methods applied at the time of the examination, not added to the radiograph at a later point, are appropriate. This rule applies to digital radiography as well. DICOM 3.0 is considered current standard. Conventionally and digitally obtained radiographs are equally valid.



Label and marker must be readable on every view. Abbreviations for right fore, left fore, right hind and left hind may be used for marking limbs. In case of doubt the marker should be placed off-centre (lateral) to the body. The labelling should minimally contain the owners or clients name, name of the horse, ID number, date of examination and name of producer of the radiograph. Age, coat colour and gender of the horse may be added. There should be no doubt as to which horse the radiograph belongs.

Removal of shoes is recommended for the lateromedial survey view of the phalanges as well as for the dorsoproximal – palmarodistal oblique view of the navicular bone. Removal of the shoes is mandatory if the areas can not be evaluated due to coverage and/or if additional quality deficiencies are expected. All parties should be in agreement if new radiographs are deemed necessary and not taken.

Recommendation for techniques concerning standard projections:

1. Toe 90°This survey view of the fore and hind limbs is seen indispensable.
The 90° toe-examination is carried out on a ground parallel elevation (a block). The flexed lateromedial view carried out on an oxspring-block is not regarded standard, but additional view. Contour of hoof capsule including hoof apex (fore limb), fetlock joint and proximal sesamoid bones should be visible.
An elevation of the hind toe is not necessary if the predominant part of the hoof is displayed.

It is not possible to image the coffin joint, navicular bone, fetlock joint and proximal sesamoid bones in the 90° survey view of the toe.
2. Oxspring-view (navicular bone, dorsoproximal – palmarodistal oblique view)
The navicular bone shall be displayed in the distal half of P II. The distal border of the navicular bone must not overlap the joint space of the coffin joint. Quality must permit evaluation of contours and structure. Coffin and short pastern bone should be included in the survey view. The survey view provides more information concerning overall constitution of the phalangeal bones compared to a detail view (focussed navicular bone).
3. Tarsal joint
Three views are recommended for standard examination (0° / 45°-70° / 90°-135°). Deviation to only two radiographs should include the 45°-70° and 90°-135° view. Every view of the tarsal joint must display the calcaneus and the proximal aspect of the third metatarsal bone.

Recommendation for techniques concerning the advanced radiological examination:

The extent of an advanced radiological investigation needs to be agreed by and clarified to vendor and purchaser.

Agreement:	techniques
Clarification:	evidence potential

4. Stifle
Techniques used: 90° - 115° and 0°/180°
Patella, distal aspect of the femur and proximal aspect of the tibia including the fibula head have to be displayed.
Reduced quality has to be expected particularly at the 180° view in an examination of a standing horse
5. Back (spinous processes)
Techniques used: 90° and 270° respectively



Proximal aspects of the spinous processes and concerning spaces have to be displayed (T4-L4 possible in theory). In the standing horse imaging of the thoracic and cranial lumbar spine is only partially possible. Findings at the vertebral joints and bodies must be mentioned as far as they are imaged. These are not classified. At least two radiographs using 40 cm cassettes are needed for complete exposure (T4-L4). On agreement the examination can be reduced to one exposure of the saddle position surrounding T15.

Description of Findings

Extent and localisation of findings may be drawn into prepared joint sketches. Artefacts and findings commonly seen as radiological anatomical (normal) variations are not drawn in. Radiological sketches of the standard projections of phalanges, tarsus, stifle and spinous processes are added to support the finding description.

Unclear, vague or suspicious findings on the standard projections should be confirmed by specific views. In case of doubt, control-views should be taken to confirm severe (class IV) findings and to exclude artefacts. These are obtained by repeating previous techniques or as additional views by different techniques.

Description of the finding in written text should include:

1. Character and structure, e.g.
 - radiolucent or radiopaque
 - reduced (osteoporosis) or increased structural density (sclerosis) with grading:
mild, moderate, severe (not exactly specified, rather personal appreciation)
 - homogeneous or heterogeneous
 - diffuse or circumscriptive
2. Form and contour, e.g.
 - concave or convex
 - new bone or defect
 - smooth or rough
 - rounded or angular/pointy
 - conical, cylindrical, bulb shaped, branched
3. Size and extension, e.g.
 - length, width, diameter approx. in millimetre or analogy, e.g. grain of mustard seed
 - digitally obtained radiographs need to be benchmarked; applied groedel-technique must be declared if applicable
4. Localisation, e.g.
 - dorsal or palmar/plantar
 - cranial or caudal
 - proximal or distal
 - articular or periarticular
 - medial or lateral
 - axial or abaxial
 - median or paramedian
 - medullary or cortical or periosteal
 - subchondral
 - central



The description of findings should be assigned to the relevant finding number of the Radiology-Guidelines. It is possible that not every finding is listed in the Radiology-Guidelines. Findings that are not listed have to be described; they are not classified.

Evaluation

An allocation into following four classes is conducted for evaluation.

Class I:

Without specific abnormal radiological findings and findings categorised as anatomical variations.
(Ideal condition)

Class II:

Findings mildly deviating from ideal condition; appearance of clinical issues estimated less than 3% in an indefinite time. (Norm condition)

Class III:

Findings deviating from norm condition; appearance of clinical issues estimated in 5 – 20% in an indefinite time.
(Acceptance condition)

Class IV:

Findings severely deviating from norm condition; appearance of clinical issues likely (more than 50%)
(Risk condition)

Intermediate classes:

The use of intermediate classes I-II, II-III and III-IV results from different examiners and their experience and interpretation of the distinctiveness of findings. Further sub-division is not allowed. The difference in percentage in between classes II, III and IV corresponds to division in intermediate classes II-III and III-IV.

Class II findings may be described. Findings of the classes II-III, III, III-IV and IV have to be described in the report.

Findings of classes II-III and III-IV according to Radiology-Guidelines which are classified II or III by the examiner have to be described. Deviation from the Radiology-Guidelines has to be mentioned; upgrading or downgrading must be comprehensibly explained.

Deviation from definite classification (e.g. class III or IV) is not allowed.

The grading into classes is only related to radiological findings (radiological evaluation).

It is recommended to mention the classification of each individual finding, as well as the class assigned overall. The classification of the highest single finding should match the radiological total.

Clinical findings (history, inspection, palpation, function and results of provocation tests) in combination with radiological findings may influence the individual veterinary recommendation (final evaluation of the horse) in a positive or negative way.

An X-Ray-CD compiled by the working committee “Röntgen-CD RöLF 07” according to the “Röntgen-CD RöLF 02” shall give examples of the following finding descriptions.



1. Toe 90°

Class

1.1 Hoof-angle 90°

1.1.1	front	45 – 55°	I
1.1.2	hind	50 – 55°	I
1.1.3	front	40 – 45° and 55 – 60°	II
1.1.4	hind	45 – 50° and 55 – 60°	II
1.1.5	front	< 40° and > 60°	III
1.1.6	hind	< 45° and > 60°	III
1.1.7	difference	right/left > 5°	III

Hoof-pastern-axis 90°

1.2.1	straight	front	45 – 55°	I
1.2.2	straight	hind	50 – 55°	I
1.2.3	straight	front	40 – 45° and 55 – 60°	II
1.2.4	straight	hind	45 – 50° and 55 – 60°	II
1.2.5	straight	front	< 40° and > 60°	III
1.2.6	straight	hind	< 45° and > 60°	III
1.2.7	straight	difference	right/left > 5°	III
1.2.8	broken > 5°	at coffin joint	as flexion	II – III
1.2.9	broken > 5°	at coffin joint	as hyperextension	II – III
1.2.10	broken > 5°	at pastern joint	as flexion	II – III
1.2.11	broken > 5°	at pastern joint	as hyperextension	II – III

Hoof wall – pedal bone 90°

1.3.1	hoof wall – dorsal pedal-bone-contour	parallel	I
1.3.2	hoof wall – dorsal pedal-bone-contour	divergent distal half	II – III
1.3.3	hoof wall – dorsal pedal-bone-contour	not parallel ≤ 3° (rotation)	II – III
1.3.4	hoof wall – dorsal pedal-bone-contour	not parallel > 3°	III – IV
1.3.5	hoof wall – dorsal pedal-bone-contour	not parallel, rotation around apex	III
1.2.6	radiolucency in the pedal bone		III – IV

1.4 Distance hoof wall – pedal bone 90° (warmblood)

measured in right angle from coffin bone middle

1.4.1	< 1.5 cm – 2.0 cm	I – II
1.4.2	> 2.0 cm	III – IV

1.5 Pedal bone – solar margin 90°

1.5.1	smooth in the dorsal half	
	mild irregular contour of the palmar/plantar half	I – II
1.5.2	fracture including “apex”	III – IV
1.5.3	new bone at the contour	II – III
1.5.4	severe irregular contour of the palmar/plantar half	III
1.5.5	atrophy at the contour smooth	III
1.5.6	osteolysis in the palmar/plantar half	IV



1.5.7	solar margin – sole angle > 5°	III
1.6	<u>Dorsal contour – pedal bone 90°</u>	
1.6.1	straight with smooth contour	I
1.6.2	claw-shaped deformity, mild	II
1.6.3	claw-shaped deformity, severe	II – III
1.6.4	new bone at the solar margin	III
1.6.5	new bone at the distal half, smooth contour	II
1.6.6	new bone, irregular contour	III
1.6.7	atrophy of the apex	III
1.7	<u>Extensor process 90°</u>	
1.7.1	rounded, slender	I
1.7.2	broad, angled, pointy (not rounded), two-summit-contour, smooth	II
1.7.3	pointy elongated margin	II – III
1.7.4	multi-spiky, irregular, and/or blurred contour	II – III
1.7.5	isolated radiopacity with variable interpretation	II – III
1.7.6	isolated radiopacity with variable interpretation and mild dorsal new bone at pedal bone and distal pastern bone	III
1.7.7	radiolucent line at the base	IV
1.8	<u>Palmar/plantar process of the pedal bone 90°</u>	
1.8.1	radiolucent line (interpretation as fissure or fracture)	IV
1.8.2	isolated radiopacity at the palmar/plantar process	II
1.9	<u>Navicular bone 90°</u>	
1.9.1	medullary sclerosis (uncertain finding, additional views are recommended)	III – IV
1.9.2	medullary osteoporosis	II – III
1.9.3	new bone (or isolated radiopacity) at the lateral margin or at the proximal border	II – III
1.9.4	central depression (flat concavity) at the sagittal ridge	I
1.9.5	penetrating lesion of the flexor surface (defined defect)	IV
1.9.6	cyst-like lesion	IV
1.9.7	osteophytes at the coffin joint	II – III
1.9.8	distinct difference of findings right – left	II – III
1.10	<u>Ossification of foot cartilages 90°</u>	
1.10.1	at onset (one or both sided)	II
1.10.2	moderate to total	II – III
1.10.3	isolated in cartilages	II
1.10.4	radiolucent line in ossified cartilage	III
1.11	<u>Coffin joint 90°</u>	
1.11.1	joint space regular	I
1.11.2	contour changes in the surface of pedal bone or small pastern bone	III – IV
1.11.3	structural changes of the subchondral bone	III – IV
1.11.4	new bone at the dorsal articular margin of the small pastern bone	II – III



1.11.5	new bone at the palmar articular margin and/or the proximal of the navicular bone.....	III – IV
1.11.6	new bone at the dorsal contour of the small pastern bone, irregular, rough.....	III – IV
1.12	<u>Distal pastern bone 90°</u>	Class
1.12.1	smooth contoured bulging of distal abaxial ligament insertions.....	I – II
1.12.2	dorsal new bone (proximal, extraarticular).....	II – III
1.12.3	bony spur at the palmaro-/plantaroproximal aspect.....	II – III
1.12.4	palmar/plantar new bone at insertion of the supf. digital flexor tendon.....	II – III
1.12.5	radiolucency (cyst-like lesion).....	IV
1.13	<u>Pastern joint 90°</u>	
1.13.1	subluxation.....	III
1.13.2	osteophyte dorsoproximal, small, smooth, at forelimb.....	II – III
1.13.3	osteophyte dorsoproximal, small, smooth, at hindlimb.....	II
1.13.4	osteophyte dorsoproximal, large, rough.....	III – IV
1.13.5	new bone periarticular, small with or without soft tissue shadow.....	II – III
1.13.6	new bone periarticular, large with or without soft tissue shadow.....	III – IV
1.13.7	isolated radiopacity, forelimb.....	III – IV
1.13.8	isolated radiopacity, hindlimb.....	II – III
1.14	<u>Proximal pastern bone 90°</u>	
1.14.1	enthesiophyte, palmar/plantar, insertion of oblique sesamoidean ligaments.....	II – III
1.14.2	enthesiophyte, dorsal (dorsolateral insertion of lateral digital extensor tendon).....	II – III
1.14.3	new bone, dorsal, periosteal, periarticular.....	II – III
1.14.4	isolated radiopacity palmar/plantar of prox. pastern bone interpretation as bony fragmentation.....	III
1.14.5	isolated radiopacities palmar/plantar of prox. pastern bone interpretation as ossification in the DDFT.....	III – IV
1.14.6	isolated radiopacities palmar/plantar of prox. pastern bone interpretation as ossification in the distal sesamoidean ligaments.....	III – IV
1.14.7	radiolucency (cyst-like lesion).....	IV
1.15	<u>Fetlock joint 90°</u>	
1.15.1	new bone dorsodistal MC III / MT III.....	II – III
1.15.2	osteophyte dorsoproximal pastern bone.....	II – III
1.15.3	MC III / MT III new bone at insertion of joint capsule, supracondylar.....	II – III
1.15.4	groove, dorsoproximal at edge of sagittal ridge without fragment.....	II
1.15.5	groove, dorsal sagittal ridge without fragment.....	II – III
1.15.6	groove, dorsal sagittal ridge with fragment.....	III
1.15.7	enlarged periarticular soft tissue shadow.....	III
1.15.8	isolated radiopacity, dorsal or dorsoproximal.....	II – III
1.15.9	isolated radiopacity, palmar/plantar.....	II – III
1.15.10	proximopalmar/plantar concavity at MC III / MT III.....	III
1.15.11	hook shaped deformity of palmar/plantar sagittal ridge.....	II – III
1.15.12	axis buckling of distal MC III / MT III.....	II – III



	Class
1.16 <u>Proximal sesamoid bones 90°</u>	
1.16.1 osteophyte at distal or proximal articular margin.....	II – III
1.16.2 coarsely meshed structure pattern.....	II – III
1.16.3 osteolysis or radiolucency (cyst-like lesion).....	III – IV
1.16.4 new bone at palmar/plantar contour (annular ligament), mild.....	II – III
1.16.5 new bone at palmar/plantar contour (annular ligament), moderate to severe.....	III – IV
1.16.6 soft tissue shadow as constriction in the area of the annular ligament.....	II – III
1.16.7 new bone at apex.....	II – III
1.16.8 new bone at base, small and smooth.....	II
1.16.9 new bone at base, considerable or rough.....	II – III
1.16.10 narrow vascular channels.....	II
1.16.11 structural disintegration surrounding vascular channels, forelimb.....	III
1.16.12 structural disintegration surrounding vascular channels, hind limb.....	II – III
1.16.13 isolated radiopacity proximal of apex.....	II – III
1.16.14 radiolucent line, fissure/fracture.....	III – IV
1.16.15 considerable size difference, lateral – medial with smooth contours and regular structure..... (consider projection related magnification)	II – III
1.16.16 considerable size difference, lateral - medial with irregular contours and irregular structure..... (consider projection related magnification)	III – IV
1.16.17 increased distance, proximal pastern bone – proximal sesamoid bones.....	II – III
1.16.18 cloudy or lamellar radiopacities in the run of suspensory ligament, flexor tendons and flexor tendon sheath.....	III – IV

2. Oxspring view 0° **Class**

2.1 <u>navicular bone 0°</u>	
2.1.1 considerable difference of findings right – left, re size.....	II – III
2.1.2 cons. diff. of findings right – left, re shape of navicular bone.....	II – III
2.1.3 cons. diff. of findings right – left, re shape and no. of vascular channels.....	II – III
2.1.4 number of distal sesamoidean channels in the central straight part.....	I
2.1.5 location of channels proximal.....	III
2.1.6 location of channels distal – central.....	I
2.1.7 location of channels junction to angled side aspect.....	II – III
2.1.8 location of channels angled side aspect.....	III – IV
2.1.9 length of channels more than ¼ of navicular bone width.....	II
2.1.10 shape of channels narrow, pointy, wide, conical, cylindrical.....	I – II
2.1.11 shape of channels small bulb-like (less than mustard seed size).....	II – III
2.1.12 shape of channels large bulb-like (peppercorn size and more).....	III – IV
2.1.13 shape of channels branched (Y-shaped).....	III – IV
2.1.14 structure coarsely meshed in total.....	II – III
2.1.15 structure coarsely meshed partially.....	III
2.1.16 structure osteoporotic (atrophy of structure).....	II – III
2.1.17 structure sclerotic.....	III
2.1.18 structure central radiolucency (cyst-like lesion)..... verification views recommended	IV



2.1.19	structure	central radiolucency (collapse).....IV verification views recommended
2.1.20	structure	radiolucent lines, interpretation as fracture, ossific.-disturbance (exclude artefacts).....IV verification views recommended
2.1.21	contour – new bone	side aspects, pointy.....III
2.1.22	contour – new bone	proximal.....II – III
2.1.23	contour – new bone	distal, at junction to angled side aspect.....II – III
2.1.24	contour – new bone	isolated radiopacity at junction to angled side aspect.....II – III
2.2	<u>Pedal bone 0°</u>	Class
2.2.1	radiolucent lines, interpretation as fracture (exclude artefacts).....IV verification views recommended	
2.2.2	radiolucency (cyst-like lesion)	verification views recommended.....IV
2.2.3	contour – solar margin	consistent.....I
2.2.4	contour – solar margin	irregular.....II – III
2.2.5	contour – solar margin	severely irregular.....III – IV
2.2.6	contour – solar margin	central flat indentation (crena).....II
2.2.7	contour – solar margin	large conical or rounded indentation.....II – III
2.2.8	contour – solar margin	with isolated radiopacity.....III – IV
2.3	<u>Ossification of foot cartilages 0°</u>	
2.3.1	at onset (one or both sided).....II	
2.3.2	moderate to total.....II – III	
2.3.3	isolated in cartilages.....II	
2.3.4	radiolucent line in ossified cartilage.....III	
2.4	<u>Distal pastern bone 0°</u>	
2.4.1	indentation at mid-surface of the distal joint.....II – III	
2.4.2	radiolucency (cyst-like lesion).....IV Verification views recommended at superimposition of distal navicular bone margin and distal pastern bone margin	
2.4.3	radiolucency (enlarged medullar cavity).....I	
2.4.4	osteophyte proximomedial and/or –lateral.....II – III	
2.5	<u>Proximal pastern bone 0° (if imaged)</u>	
2.5.1	new bone distal at insertion of oblique sesamoidean ligaments.....II – III	
2.5.2	new bone distal at insertion of collateral ligaments.....II – III	
2.5.3	new bone proximal at insertion of collateral ligaments.....II – III	
2.5.4	osteophytes at fetlock joint.....II – III	
2.5.5	fracture or fissure line (exclude artefacts) verification views recommended.....IV	
2.5.6	radiolucency (cyst-like lesion) proximal or distal, central or abaxial.....IV Verification views recommended	



3. Tarsus 0°, 45-70°, 90-135°

Class

3.1 Tarsocrural joint

3.1.1	tibia	smooth contoured craniodistal new bone.....	II
3.1.2	tibia	flattening in the area of the sagittal ridge.....	II
3.1.3	tibia	indentation in the area of the sagittal ridge.....	II – III
3.1.4	tibia	isolated radiopacity, single fragment, compact.....	II – III
3.1.5	tibia	isolated radiopacity, malacic dissecate or multiple	III – IV
3.1.6	tibia	radiolucency (cyst-like lesion).....	IV
3.1.7	tibia	persistent distal fibular physis.....	I – II
3.1.8	tibia	persistent distal tibial physis.....	II
3.1.9	tibia	malleoli new bone.....	II - III
3.1.10	tibia	malleoli isolated radiopacity.....	III
3.1.11	tarsocrural joint	free isolated radiopacity.....	II – III
3.1.12	talus	distally directed bony exostosis.....	II
3.1.13	talus	distally directed bony exostosis with radiolucent line.....	II – III
3.1.14	talus	isolated radiolucency in the tarsocrural joint recess.....	II – III
3.1.15	talus	isolated radiolucency, dorsal of central tarsal bone.....	II – III
3.1.16	talus	radiolucency (cyst-like lesion).....	IV
3.1.17	talus	trochlear, indentation, flattening.....	II
3.1.18	talus	trochlear, isolated radiopacity.....	III
3.1.19	calcaneus	new bone proximal and distal at sustentaculum tali.....	III –IV
3.1.20	calcaneus	talocalcaneal joint space, sclerosis and local lucency.....	III – IV
3.1.21	calcaneus	circumscribed structural changes.....	II – III
3.1.22	calcaneus	osteolysis.....	IV
3.1.23	calcaneus	radiolucency (cyst-like lesion).....	IV

3.2 Intertarsal joints and tarsometatarsal joint

Class

3.2.1	distinct continuous joint spaces, even bone structure.....	I
3.2.2	distinct synovial fossae, no deformation of tarsal bones.....	I
3.2.3	blurred or narrow joint spaces.....	II
3.2.4	considerable narrowed joint spaces (line-shaped).....	III – IV
3.2.5	osteophytes, rounded or pointy up to 2 mm.....	II – III
3.2.6	osteophytes, rounded or pointy more than 2 mm.....	III
3.2.7	osteophytes at MT III up to 2 mm.....	II
3.2.8	osteophytes at MT III more than 2 mm.....	II – III
3.2.9	structural blurring and indentions in joint spaces.....	IV
3.2.10	cyst-like lesions (verification views).....	IV
3.2.11	closure of joint spaces and synovial fossae.....	III – IV
3.2.12	periosteal reaction flattened; smooth.....	II – III
3.2.13	periosteal reaction rough and irregular.....	III – IV
3.2.14	capsule calcification.....	III – IV
3.2.15	inner enthesiophytes with or without ankylosis.....	IV
3.2.16	periosteal and desmal new bone at MT III – MT II – MT IV	
3.2.17	(splint, if imaged).....	II – III
3.2.18	sagittal radiolucent line in the proximal MT III joint surface (0° view).....	III



3.2.19	irregular sclerosis at proximal MT III (0° view) suspensory desmitis at its origin.....	III
3.2.20	hypertrophy of the lateral splint bone head or 4 th tarsal bone.....	III
3.2.21	periosteal new bone at the lateral splint bone.....	III
3.2.22	deformation of central or third tarsal bone.....	III – IV
3.2.23	smooth bony exostosis at the proximal MT IV.....	II

4. Stifle

4.1 Patella (stifle 90 – 115° / LM)

4.1.1	cranial surface	contour changes	rounded, smaller 5 mm.....	II
4.1.2	cranial surface	contour changes	irregular, rough.....	II – III
4.1.3	cranial surface	contour changes	pointy spikes.....	III
4.1.4	cranial surface	contour and structural changes.....		II - III
4.1.5	cranial surface	isolated radiopacity.....		II – III
4.1.6	patellar base	cranial exostosis at margin, 2 mm and larger.....		I – II
4.1.7	patellar base	joint adjacent exostosis, larger than 2 mm.....		III
4.1.8	patellar base	isolated radiopacity.....		III
4.1.9	patellar base	ostephyte at prox. articular surface, smaller 3 mm.....		II – III
4.1.10	patellar base	ostephyte at prox. articular surface, larger 3 mm.....		III – IV
4.1.11	articular surface	central contour changes.....		IV
4.1.12	articular surface	radiolucency (cyst-like lesion).....		IV
4.1.13	patellar apex	new bone	rounded, smaller 5 mm.....	II
4.1.14	patellar apex	new bone	pointy spikes, larger 3 mm.....	III
4.1.15	isolated radiopacity.....			III
4.1.16	radiolucent lines (interpretation as fissure or fracture).....			III – IV
4.1.17	radiolucency (cyst-like lesion).....			IV

4.2 Femoral trochlea (stifle 90-115°)

Class

4.2.1	indentation, cranioproximal or –distal at the medial ridge.....	I – II	
4.2.2	smooth flattening of the lateral ridge at its intermediate third.....	II – III	
4.2.3	irregular flattening of the entire trochlear contour.....	III	
4.2.4	structural changes (oval, spindle-shaped, irregular) distal to lateral trochlear contour.....	III	
4.2.5	isolated radiopacity	without contour flattening, smaller 2 mm.....	II – III
4.2.6	isolated radiopacity	without contour flattening, larger 2 mm.....	III
4.2.7	isolated radiopacity	with contour flattening.....	III – IV
4.2.8	isolated radiopacities	two or more.....	III – IV
4.2.9	isolated radiopacity(ies)	in the distal joint region.....	III – IV
4.2.10	radiolucency (cyst-like lesion) at trochlear ridge region.....		IV



4.3	<u>Femorotibial joint</u> (stifle 90-115°)	
4.3.1	isolated radiopacity(ies), also blotchy, in the meniscal area (cranial or caudal).....	IV
4.3.2	intercondylar eminence	irregular contour, smooth.....II
4.3.3	intercondylar eminence	irregular contour, rough.....II – III
4.3.4	intercondylar eminence	spiky and/or edge-like contour changes.....III – IV
4.3.5	intercondylar eminence	radiolucent line (interpretation as fissure or fracture).....IV
4.3.6	femoral condyle	radiolucency /cyst-like lesion).....IV
4.4	<u>Tibial tuberosity</u> (stifle 90-115°)	
4.4.1	contour changes	smooth.....II
4.4.2	contour changes	pointy / spiky (larger 2 mm).....III
4.4.3	notch-like indentation at distal apophyseal (this isn't right, but I don't know what you mean – the tibial tuberosity is an apophysis, correct technical term) junction (older than 4 years).....	II – III
4.4.4	radiolucent line	(interpretation as fissure or fracture).....IV
4.5	<u>Femorotibial joint</u> (stifle 0° or 180°)	
4.5.1	medial femur condyle	contour changes in central joint surface Indentation with sclerosis.....II – III
4.5.2	medial femur condyle	contour changes in central joint surface Indentation without sclerosis.....III
4.5.3	medial femur condyle	ostophyte, bulging at joint margin.....II - III
4.5.4	medial femur condyle	isolated opacity, millet-seed – peppercorn size..II – III
4.5.5	medial femur condyle	isolated opacity, hazelnut size.....IV
4.5.6	medial femur condyle	radiolucency (cyst-like lesion).....IV
4.5.7	intercondylar fossa	irregular contour, abaxial lateral.....II – III
4.5.8	lateral femur condyle	smooth, also protruding contour of the lateral epicondyle.....I
4.5.9	lateral femur condyle	intersection to condylar fossa New bone and/or deformation.....II – III
4.5.10	femorotibial joint	lateral and/or medial isolated radiopacity.....III – IV
4.5.11	tibia	radiolucency, intercondylar area.....I
4.5.12	tibia	new bone, medial condyle.....II – III
4.5.13	tibia	cyst-like lesion, lateral and/or medial.....IV
4.5.14	tibia	intercondylar eminence, radiolucent line.....III – IV
4.5.15	tibia	intercondylar eminence, deformity by new bone.....III
4.5.16	fibula	one or more transverse radiolucent lines.....I
4.5.17	fibula	one or more transverse radiolucent lines, interpretation as fracture.....III – IV
4.5.18	new bone in between fibula and tibia.....	III



5. Back

Class

5.1 Spinous processes, withers

5.1.1	new bone	dorsal.....	II
5.1.2	new bone	cranial and/or caudal.....	II – III
5.1.3	deformation	mild.....	II
5.1.4	deformation	moderate – severe.....	II – III
5.1.5	deformation	with pseudo-joint formation	III
5.1.6	deformation	ankylosis.....	III
5.1.7	fractures	chronic, healed, with/without dislocation.....	III – IV
5.1.8	spinous process with cyst-like lesion.....		III – IV

5.2 Spinous processes of saddle position and lumbar spine

5.2.1	interspinous spaces, more than 8 mm	without reactive changes.....	I
5.2.2	interspinous spaces, 2 – 8 mm	without reactive changes.....	II
5.2.3	interspinous spaces, smaller 2 mm	without reactive changes.....	II – III
5.2.4	interspinous spaces, 2 – 8 mm	with reactive changes (sclerotic margins, new bone).....	II – III
5.2.5	contacting sp. processes	without considerable changes.....	III
5.2.6	contacting sp. Processes	severe sclerosis and/or new bone.....	III – IV
5.2.7	contacting sp. Processes	with cyst-like lesion.....	III – IV
5.2.8	spinous process with cyst-like lesion.....		III – IV
5.2.9	over-riding of spinous process summits.....		III – IV
5.2.10	new bone	dorsal.....	II
5.2.11	new bone	cranial or caudal contour.....	II – III
5.2.12	new bone	dorsal, cranial and/or caudal directed projection.....	II
5.2.13	new bone	projection with radiolucent line.....	II – III
5.2.14	radiopacity, dorsal, cap-shaped.....		II – III

Authors

Gerd Brunken¹, Hartmut Gerhards²,
Bodo Hertsch³, Werner Jahn⁴

1.) Equine Veterinary Clinic Dr. Brunken, Verden. 2.) Clinic for Horses, Ludwig-Maximilian-University, Munich. 3.) Clinic for Horses, gen. Surgery & Radiology, Free University of Berlin. 4.) Pferdekllinik Bargteheide

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Responsible Institutions

Gesellschaft für Pferdemedizin e. V.
(German Association for Equine Medicine)
Postfach 55 02 51
D – 44210 Dortmund
phone/fax +49-231-737399
<http://www.g-p-m.org>
info@g-p-m.org

Bundestierärztekammer e. V.
(Federal Board of Veterinarians)
Oxfordstraße 10
D – 53111 Bonn
phone: +49-228-725460
fax: +49-228-7254666
<http://www.bundestieraeztekammer.de>
geschaeftsstelle@btk-bonn.de
(1jul9engl)