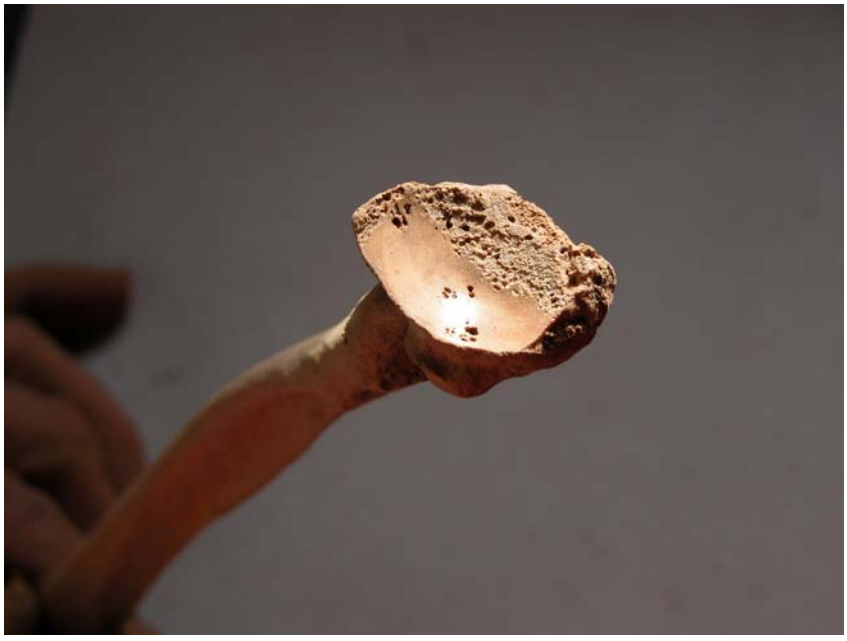
Elsa Pacciani

Anthropological description of skeletons from graves no. 4, 62, 63, 65, 66, 67 and 68 at Skriðuklaustur Monastery



Skýrslur Skriðuklaustursrannsókna XIV

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Ritstjóri Steinunn Kristjánsdóttir.
Skriðuklaustursrannsóknir.
Reykjavík.

Anthropological description

SKR -36 –2006 Grave 4

(Fig. 1., 2., 3.).

Sex: male (morphological diagnosis, on the basis of all the most discriminant skull and hip bone features and the aspect of the whole skeleton).

Age at death: mature adult (30-50 years). Because of the impossibility to refer to the whole sample it is not advisable to assign a more precise age, as all age indicators are subject to high individual and population variability. In particular we can observe: a) tooth wear is not advanced (phase F or G according to the scale of Lovejoy, 1985. Such a degree corresponds to the age class 30-50, according to a recent study on a Florentine 19th century sample of known age at death, by Frederic *et al*., 2006); b) cranial sutures strengthen a mature, not old, age: closure occurred in the *obelion* region of the sagittal suture and in the *pterion* region of the coronal one, and was starting in the medial part of the lambdoid; c) rib sternal ends, the auricular surface of the ilium and the pubic symphysis show a moderate degeneration; d) vertebral cancellouos bone has a fine trabeculation, without osteoporosis signs e) degenerative joint arthritis is slight and probably due also to stressing activity, except lumbar arthritis which is advanced f) the ossification of the thyroid cartilage is an ageing sign and move forward the diagnosis within the above indicated interval.

Stature: cm 172, calculated by the formula of Olivier et al. 1978, based on the physiologic lenght of the femur (n. 2 according Martin and Saller)

Dental characteristcs:

All the teeth are present except third molars, never erupted (probable agenesia).

Teeth are uninjured by caries, indicating a diet without sweet carbohydrates.

No malocclusion is obseved except a vestibular dislocation of the second left maxillary molar.

Maxillae are affected by periodontitis (exposed roots).

Abundant calculus covers most of the teeth on buccal and lingual side, indicating probably a rich of meat diet (Fig 4).

An abscess fistula is observable on the buccal side of the maxilla, just next to the lateral right incisor: this does not seem due to caries, but to a fracture (because of very sharp, cutting edges) of the tooth, which produced a vertical sulcus driving bacteria into the alveolus (Fig 5).

Occupational stress indicators and pathological aspects:

Biomechanical stress indicators are mostly localized on shoulder girdles and upper limbs.

- Scapulas show extraordinarily developed lines for the insertion of subscapularis muscle, and the humeral insertions of this muscle are affected by a rarely high level of enthesopathy (Fig. 6).

Also the lateral edge of the scapulas (where are the teres major and teres minor insertions) are particularly pronounced, and the teres major insertions on both humerus are affected by enthesopathy, which rarely is so severe (Fig. 6). The mentioned muscles are involved in shoulder movements. At the lower angle of the right scapula an area approximately 8 cm^2 appears swollen and porous on both faces, as following an inflammatory process, just in

correspondance to the teres major insertion (Fig. 7-8). It is not possible to detect the bilaterality because the left angle is lacking.
The left scapula shows the so called *bipartite acromion*, that is the non-fusion of the acromion process, due to the tearing of the rotator cuff for continued and heavy loading of the arm. It was found in archers and in workers who routinely carry heavy loads on their shoulders (Stirland 1984; Wienker and Wood, 1988) (Fig. 9).
- The clavicle is robust and shows marked attachments for pectoralis major and deltoid muscles and for costo-clavicular ligament, mostly on the right side. This pattern has been related to stress during rapid rotatory movements of the shoulders and arms, like those of paddling. In such a movement, pectoralis major and teres major are active, while the costo-clavicular ligament stabilizes the shoulder. Deltoid muscle is particularly stressed in lifting the paddle out of the water.
- The humerus, besides the already mentioned strong enthesopathies, shows bilaterally marked attachments for pectoralis major, deltoid, common flexor (pathologic) and extensor radialis longus carpi muscles.
- The elbows are affected by osteoarthritis traces (sharp and scalloped articular edges; osteophytic ridge between capitulum and trochlea), indicating a stress condition of the area (Fig 10).
- The ulna appears very robust and well-shaped; it shows, bilaterally but more the right one, a series of marked insertions or enthesopathies of the muscles involved in flexion-extension and prono-supination movements of the forearm or in hand holding: brachialis, supinator,anconeus, triceps, flexor digitorum superficialis, abduttor pollicis longus, extensor pollicis longus, pronator quadratus, flexor digitorum profundus (Fig 11-12).
- The radius bilaterally has well marked or even enthesopathic insertions for biceps, flexor pollicis longus and abduttor pollicis longus.
- The hand is bilaterally characterized by signs of habitual efforts in firm holding: metacarpus with sharp edges for the attachment of interosseous muscles; phalanges with evident ridges for the attachment of flexor muscles (Fig. 13).
- On the contrary, hip bone and lower limb show well marked but never enthesopathic muscle insertions, indicating an active life style but without effort by this district.
- A strong difference is observable between the right and the left ischium: the first is normal, with clear insertions for adductor magnus, biceps and rectus femoris muscles, while the second has very rough, irregular surface, as if it were enthesopathic but the probable cause is a kind of trauma, like a falling; in fact the absence of morphological and insertional asymmetry between the lower limbs lets us exclude a specific activity involving mostly the left leg. (Fig. 14).
- The only enthesopathy on the lower limbs is observable on the distal part of the fibulas, in relation to the interosseous ligament.
- The first metatarsal of both feet shows an extension of the distal articular surface onto the superior surface of the bone, forming a flat facet that ends in a ridge (Fig 15) It is due to a routinary hyperdorsiflexion position of the metatarsal-phalangeal joints. Such a position, which results in pressure on the opposite articular surfaces between metatarsus and phalanx, is an indicator of squatting or kneeling posture, with the body weight pressing on foot fingers. (Ubelaker, 1978; Capasso et al., 1999).
- The vertebral column is affected by localized arthritis: only one intervertebral facet joint (the right one between 5th and 6th thoracic vertebrae, which is porous and enlarged) and some lumbar vertebral bodies with torn and scalloped edges, slipped disk-like (unfortunately vertebral bodies in this trait are not well preserved so it is impossible to detect how many of them are involved). A slight costovertebral arthritis is observable.

Localized arthritis is not an ageing effect, it rather represents the consequence of traumatic events.
On the vertebral column one can observe also the ossification of yellow ligaments, mostly due to overload efforts or ageing.

SKR -36 –2006 Grave 62

(Fig. 16)
Subadult
Age at death: 2 years, based on dental development (Ubelaker, 1978).
All the decidous teeth are present, on maxilla and mandible. Permanent first molars can be seen, unerupted.
Diaphysal lenghts of the limb bones (in mm: humerus 110; ulna 89; radio 82; femur 142; tibia 107) are clearly lower the the mean lenghts reported by various authors (Maresh 1970, Gindhart 1973. Ubelaker 1978), indicating a reduced growth that could be consequence of malnutrition or illness.
The presence of *cribra orbitalia*, porous areas on the orbital roof means that the child suffered from anaemia. (Fig. 17)

SKR -36 –2006 Grave 63

(Fig. 18-19)
Sex: male (morphological diagnosis. Even if not yet adult, the sexual secondary characters are already clearly expressed, e.g. square chin, eversed gonion of the mandible, U-shape of the sciatic notch, large acetabulum).

Age at death: subadult. 16 – 17 years old. (on the basis of the epiphyseal ossifications)

Stature: cm 168, calculated by the formula of Olivier et al. 1978, based on the maximum lenght of the humerus (n. 1 according Martin and Saller)

Dental characteristcs:
All the teeth are present, included the 3th molars, whose eruption appears particularly precox.
The upper lateral incisors and left central incisor show a slight shovel-shape.
Wear is very slight (maxillary dentition: phase B2; mandibular dentition: phase C according to the scale of Lovejoy, 1985.
An initial periodontitis affects anterior teeth.
Neither caries nor malocclusion are obseved.
A fracture occurred *ante mortem* on the left maxillary second premolar, lingual side.

Pathological aspects:
Multiple lesions affect different parts of the skeleton; some of them are extended and severe, so that they could be the signs of the disease that caused the death.
1- the right tibia shows the most visible lesion: a large, oval, slightly concave area, with porous bottom and raised and clearly outlined edges, extends on the antero-medial face at about the midshaft (mm 60 long x mm 36 wide) (Fig.20). The antero-medial face of the tibia is affected by periostitis and osteitis at the same level, such as the bone sorrounding the lesion, so that the diaphysis appears very inlarged. Periostitis, with porosity and bony apposition, is observable also on the fibula at the same level, as inflammatory reaction

spread for contiguity(Fig.21). The features of the lesion are those of a periosteal reaction resulting from a trauma, e. g. a direct penetrating wound, or an extension of an inflammatory process of the soft tissues surrounding the bone. The sharply demarcated and thickened border can be the bony response to an open skin ulcer.
2 – the medial condyle of the right femur shows a deep and large erosion (mm 30x15) with irregular margins and porous, remodeled bottom; it is a lithic endoarticular lesion which deepen in the cancellous bone (Fig.23). Probably the focus originates from an hematogenous infection, driven by the bood stream through the cancellous bone. The subchondral bone erosion caused the cartilage collapse, with consequent spreading of the flogosis into the endocapsular space, as attested by the reactive sclerosis of the condyle articular surface and by the enlarged attachment of the posterior cruciate ligament in the intercondylar fossa, indicator of suffering. (Fig 23)
3 –the proximal part of the diaphysis of the left humerus is strongly curved medially and backward. The area is characterized by bony remodeling, porosity and one osteophitic thorn. Moreover, reactive enthesopathy involves the teres major and pectoralis major insertions (Fig.24). The incompleteness of the bone prevents from detecting the whole end area but the characteristics are those of an hematogenous osteomyelitis.
4 – the right ulna shows, approximately at the middle diaphysis, a morphological alteration of the interosseous margin, which is also crossed by 3 vascular imprints.

All these alterations, either intra- or extraarticular, indicate a picture of septic systemic disease. The bacteria were probably disseminated by the blood stream from an original infectious focus that could be the lesion on the tibia. Long and large bones of the extremities, like humerus and femur, are most susceptible to osteomyelitis, especially in the metaphyseal and epiphyseal area where blood supply is greatest, red marrow is abundant and cell reproduction is considerable. Especially in the young people these areas can become elective for the bacteria diffusion.
If the tibial lesion was the only one in the skeleton, the most probable diagnosis would be an inflammatory response of the periostium to a local trauma; the presence of multiple lesions involving different bones does not necessarily weaken this hypotesis of an infection spreading from a primary focus, but leads us to take into account the possibility of a systemic infection of different origin (Ortner and Putschar, 1985).

Other observations:
a) the occipital left condyle and the left border of the *foramen magnum* appear distorted and scalloped; an irregular shaped ditch can be observed beyond the right condyle (Fig.22). Many vertebral facets, along the whole column, show degenerative alterations that could be attributed to an anomalous posture, but unfortunately almost all the bodies are lost and it is impossible to detect the real vertebral condition. The aspect of the condylar region could be considered in the context of the systemic disease above described but we must take into accont other possibilities, such as a malformation or a neuromechanical deformity of the spine.
b) The first metatarsal of both feet shows an extension of the distal articular surface onto the superior surface of the bone.This feature (see the individual of the grave 4) suggests an habitual squatting or kneeling posture (Fig.25).
c) The trochlea of the talus of both feet has a forward extended articular surface, due to habitual position of the feet in hyperflexion on the tibia (Fig. 26). The stressing factor can be the same as the previous feature.

d) Both clavicles show a marked enthesopathy of deltoid muscle and costo-clavicular ligament insertions (Fig.27), indicating a stress during the rotatory movements of the upper limb (see the individual of the grave 4).

SKR -36 –2006 Grave 67

(Fig. 23)

Sex: female: all the most discriminant morphological traits are coherent; only the mandible has a masculine aspect, due to the insertion ridges for the masticatory muscles and the square chin, moreover the nuchal ridges - for the insertion of the sternocleidomastoid muscle and trapezius muscle (one of the major scapular rotators) - are very prominent too.

Age at death: adult (30-40 years) : 1- cranial sutures are completely open; 2- the pubic synphysis still has traces of parallel grooves; 2- the cancellous bone of the femur proximal epiphysis has a very fine trabeculation; 4- dental wear (phase G – H for maxilla and H-I for mandible, according to the scale of Lovejoy, 1985) indicates a more advanced age, but it can be due to the particularly vigorous bite (see below).

Stature: cm 151, calculated by the formula of Olivier et al. 1978, based on the physiological lenght of the femur(n. 2 according Martin and Saller)

Dental characteristcs:
- A diffuse, initial periodontitis, but no caries nor malocclusion are observed.
- Abundant calculus covers most of the teeth.
- A great masticatory strength is demonstrated by the insertion ridges of the masticatory muscles at the angle of the mandible and by the high wear speed (high wear difference among the different time erupting molars). This can be the reason why tooth wear is advanced in relation to the other age indicators.
- The upper lateral incisors show a slight shovel-shape.

Occupational stress indicators and pathological aspects:
Both scapulas are characterized by the *bipartite acromion* (Fig.24 a and 24 b)(for considerations, see Grave 4). The glenoid joints have pronounced signs of arthritis.
The right clavicle (the only one observable) shows deltoid muscle and costo-clavicular ligament enthesopaties (Fig.25) (for considerations, see Grave 4).
The right elbow is affected by a severe degeneration. The radius and ulna have a completely disrupted morphology (the humerus is not disposable at the moment). On the radius head the humeral joint surface is very enlarged, a half showing a gross porosity and a half a wide eburnation area (Fig.26); the margin is irregular and hypertrophic because of the remodeling and new bone formation (Fig.27). The ulna epiphysis is strongly alterated in shape; there is an eburnation area adjacent to the one on the radius, surrounded by a large area of very irregular new bone formation, osteophytosis and porosity (36 mm width; at least 55 mm lenght, the olecranon being incomplete for postmortem erosion). (Fig. 29 - 30). Such a degeneration can be the long-term consequence of a fracture or a dislocation (luxation). Elbow luxations are usually severe and difficult to restore to normal position. The displacement of articular ends can produce ligament rupture, capsula lesions with loss of synovial fluid, cartilage suffering; joint disease leads to secondary degenerative changes of the bone until the total distortion of its morphology. Moreover, the lesion has certainly caused pain, infermity and change in the angulation of the forearm, yet the woman went on

using this arm; in fact the posterior side of the upper half of the radius shaft is sulcated by many obliquous and parallel grooves: as this area corresponds to the attachment of the supinator muscle, it is a sign of a severe enthesopathy and therefore of a heavy and prolonged muscle effort (Fig.28). It reveals, together with the anomalous attachment of the pronator quadratus on the ulna (Fig.28b), a great stress in the prono-supination movements. The use of the arm over an extended period of time after the trauma is attested also by the eburnation, due to the loss of joint cartilage and subsequent bone-to-bone movements.
In the meantime, the other side radius and ulna show a number of compensative activity signs, mostly articular arthitis at the elbow and wrist, and enthesopaties (e.g. brachialis, triceps, extensor pollicis longus, extensor indicis, biceps, pronator quadratus, pronator teres) (Fig.31). The hands are characterized by the traces of a firm holding: metacarpals with sharp edges for the attachment of interosseous muscles; first metacarpus with enthesopathyc insertion of the opponent pollicis muscle, phalanges with evident ridges for the attachment of flexor muscles (Fig.32).
The left femur (the only one observable) is hyperplatymeric (platymeric index = 65) indicating a vigorous locomotor pattern, possibly associated to nutritional deficiency. The pronounced femural linea aspera, the vastus intermedius and vastus medialis muscles enthesopaties, the indicators of active tibial and soleus muscles on tibias and the grooved shape of fibulas confirm the hypothesis of an intense activity of the lower limbs.
The tibia shafts are markedly curved (valgism, lateral concavity).
One little *osteoma*, not malignant tumor, is located on the frontal bone, in a sagittal position, and another one, larger, on the occipital bone, also in a sagittal position.

Other observations:
-The lambda suture shows many lambdoid (wormian) ossicles and is very complex and bulging (Fig.33). This is not a pathological aspect but a genetic character concerning the ossification process.
-Despite of the rather young age the skeleton shows traces of diffuse arthritis (occipital condyles and atlas, elbow, wrist, knee), which seems secondary to stressing activities.
-The presence of the preauricular sulcus indicates that at least one pregnancy occurred.

SKR -36 –2006 Grave 68

Fetus of 6-7 months. The age is determined on the basis of the incisor teeth development (Ubelaker 1978). The diaphyseal lenghts (approximated because of a slight erosion):
humerus mm 45
ulna mm 43
radius mm 36
confirm such an age (Fazekas and Kosa, 1978).

SKR -36 –2006 Grave 66

(Fig. 34 a – 34 b)
Sex: male

Age at death: mature adult (30-40 years)**:** 1- cranial sutures are partially closed (almost all the sagittal; the coronal at the lateral segment; initially the lambdoid); 2- dental wear is slight (phase D for maxilla and E for mandible, according to the scale of Lovejoy, 1985) but a low wear speed (little wear difference among the different time erupting molars) is observed, which could lead to an underestimation of the age; 3- pubis symphysis maintains

partially the parallel grooves, while undergoing degeneration; 4- auricolar surface has a rather regular look.

Stature: cm 166, calculated by the formula of Olivier et al. 1978, based on the physiologic lenght of the femur (n. 2 according Martin and Saller)

Dental characteristics
A diffuse, initial periodontitis and presence of calculus, but no caries are obseved.
Two thin hypoplasia striae are observable on central upper incisors.
The maxillary dentition presents a slight malocclusion: the second left premolar is dislocated in the lingual direction, the first right incisor is dislocated distally.

Occupational stress indicators and pathological aspects:
The right clavicle is markedly shorter than the left one (15, 1 cm against 16,5)(Fig.43 a - b); the sternal joint is enlarged and porous (arthritis signs); a prominent thorn arises from the medial-lower-posterior edge, derived by a degenerative ossification of the costoclavicular ligament. In fact on the first rib a similar degenerative ossification is observed (Fig.44). The shortning is due to a fracture of the clavicle. Such a kind of fractures can occur from habitual carrying of heavy objects on the shoulder.
Both scapulas show the *bipartite acromion* (Fig.35)(for considerations, see Grave 4). The glenoid joints have pronounced signs of arthritis: The left one, a postero-inferior and antero-superior marginal lipping, besides an osteochondrithic pit with porous bottom and regular borders, located in the middle glenoid surface. The right one shows posterior and superior marginal lipping (Fig.36). Both scapulas are characterized by a markedly developed insertion of the triceps (Fig.35), deltoid along the acromion, teres minor and teres major.
The humerus has bilaterally well developed insertions for the subscapularis (Fig. 37) and enthesopathic (productive enthesopathy) insertions of the teres major (Fig. 38) and deltoid (Fig. 39).
Moreover arthrithic lipping can be observed on the humeral head and trochlea.
Proximal and distal arthritis can be observed also on ulna and radius bilaterally (Fig. 40). On these bones the most stressed insertions are triceps, brachialis, pronator quadratus, biceps (Fig. 40-41-42).
The hands are characterized by the traces of a firm holding: metacarpals with sharp edges for the attachment of interosseous muscles, phalanges with evident ridges for the attachment of flexor muscles. Besides, a rather advanced level of arthritis affects the radio-carpal and intercarpal joints.
The pelvic bones, femurs and tibiae reveal on the whole an intense but not stessing lower limb activity: regular ischium tuberosity, good expression of the quadriceps, gluteus maximus, ilio-psoas, adductor magnus and soleus muscles insertions.
On the anterior surface of the femural neck the anterior cervical imprint is bilaterally observable. It is produced by the extension of the femur, for example when walking or running (Kostick, 1963; Kennedy, 1989).

Other observations:
The lambda suture shows wormian ossicles and is complex and bulging, althought in a lower degree than grave 67 (for considerations, see Grave 67).
The left rotula shows a protuberance on the medial margin, and a corresponding swollen area on the articular surface.

SKR -36 –2006 Grave 65

(Fig. 46-47)

Sex: female. The most discriminant features are concordant; besides the well marked preauricular sulcus is indicator of pregnancy.

Age at death: young adult (20-30 years). 1- dental wear is very slight ((phase B1-B2 for maxilla and C for mandible, according to the scale of Lovejoy, 1985), even if we can observe a very slow rate of wearing (a very slight difference between third and first molars); 2- cranial sutures are completely open.

Stature: 159 cm, calculated by the formula of Olivier et al. 1978, based on the physiologic lenght of the femur (n. 2 according Martin and Saller) approximated because of the distal erosion.

Dental characteristics:

All the teeth are present, except the second and third upper right molars, lost *post mortem*.
Abundant calculus
No caries
Malocclusion: bucco-lingual dislocation of anterior mandibular teeth, from the lateral left incisor to the right canine (crowding). It can be put in relation with the very slow rate of wearing: the weak masticatory strenght can prevent the complete growth of the mandible alveolar area, causing a reduced space for teeth.
A large hypoplasia stria can be detected on the canine crowns, at a level corresponding to an age of about 4 years, when the child suffered from a nutritional stress (malnutrition? Long disease?).

Occupational stress indicators and pathological aspects:

The *sella turcica* (the shell on the sphenoid where is allocated the pituitary gland) is markedly enlarged and deep; the surrounding bone appears remodeled (Fig.48)
This can mean a gland hyperthrophy, i.e. because of a benign adenoma, with possible nongrowth-hormone disfunctions.
Clavicles and limb bones are particularly robust and show strong muscle insertions, mostly humerus, ulna (Fig. 55), radius (Fig.56), femur: see e.g. the exceptional expression of the pectoralis major and deltoid insertions on the clavicle (Fig.49), the deltoid and extensor radialis longus carpi on humerus, bilaterally (Fig 50 and 51)
Arthritis signs are detectable on cervical vertebrae (see the anterior arch of the atlas and some intervertebral facets) and on some costo-vertebral joints (Fig.57), which appear rather severe in relation to the young age.
The clavicles show the J –shape enthesopathy os the costoclavicular ligament (Fig.52)
On the anterior surface of the femural neck, the anterior cervical imprint is bilaterally observable (see grave 66 for considerations).

Other observations:

- A large and deep praeauricular groove indicates at least one pregnancy (Fig.54).
- Bipartite occipital condyles are observable (it is a non-metric genetic trait).
- Femur is bilaterally platymeric (index = 81,8)
- Tibia is bilaterally hyperplaticnemic (index = 59,7)

- The proximal end of one metacarpal bone appears enlarged, swollen, but maintainig its morphology, probably as a consequence of an enchondroma, benign tumor of the cartilage which occurs at any age but mostly in young adults, and mostly (about one-half) in the epiphyses of tubular bones of the hands (Fig.58).

Some anthropometric measurements in mm (code numbers according Martin and Saller):

	Grave 4	Grave 67	Grave 66	Grave 65
1- maximum cranial lenght	193		194	175
8- maximum cranial breadth	146		151	134
17- basion/bregma height	135		128	
1- maximum humerus lenght	350		328	315
2- physiological humerus lenght	345			
7- minimum hum. circumference	74		71	
1- maximum radius lenght	260		248	227
3- minimum radius circumference	54		46	
1- maximum ulna lenght	278		267	242
3- minimum ulna circumference	47			
1- maximum femur lenght	472	388	447	
2- physiological femur lenght	470	383	444	423
6- sagittal diameter in the middle	31	26	31	30
7- transv. diameter in the middle	32,5	27	26	30
9- superior transv. diameter	35	34	30	33
10- superior sagittal diameter	29	22	28	27
1- total tibia lenght	373		366	
8 a - sagittal diameter for nutr	46		35	36
9 a - transv. diameter for nutr	37		26	21,5

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51 - gr 65 humerus.enthesopaties of...


52 - gr 65 clavicle. costoclavicular ligament e...


53 - gr 65 proximal phalanx of the Hallux.articular exte...


54 - gr 65 pelvic bones. praeauricular groove


55 - gr 65 ulna. brachialis enthesopathy

56 - gr 65 radius biceps imprint

57 - gr 65 costo-vertebral arthrosis

58 - gr 65 enlarged proximal end of metacarpus

n28 gr 67 right radius

n28b gr 67 right ulna pronator quadratus