Anatomical regions and landmarks useful for analysis using the BAK system

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The static and dynamic morphological examination must be objectified by the clinician. A first inspection examination is required, immediately followed by palpation for the systematic search for the various anatomical landmarks.
Following, an adequate marking of the same is set, in order to allow a precise quali-quantitative postural analysis.
For this purpose a simple dermographic pencil can be used to mark the landmarks or use paper adhesive markers of various sizes, colors and shapes.
Unlike the marker sign, these allow a clearer vision and reading when subjected to photographic or video detection, with more reliable biometric analysis.

As per topographical anatomy, we must distinguish the various regions and identify the landmarks. Mark them in frontal, sagittal right and left, rear vision.

Front view

The inspection examination will verify:

• Head: rotations, inclinations
• Shoulders: difference in height
• Trunk: rotations, inclinations, triangles of the size (symmetry, asymmetry)
• Basin: asynclitism
• Hands: difference in height
• Femurs and shins: intra-extrarotations; femoral and tibial triangles see fig. 1

Fig.1 Overall view from the front

Head

For the superficial regions of the skull, we will use the superficial orbital region in the face region, identifying the left and right pupils respectively. In the region of the nose, we will specifically mark the root of the nose (gabella). whose marking must be made by pulling a vertical imagery that from the right and left pupils, respectively, intersects the orbital zygomatic margin. Alternatively, palpatory it is possible to identify a small salience of the orbital edge and mark v.figg.2,3 there.

Fig. 2 Applying glabella and cheekbone markers.

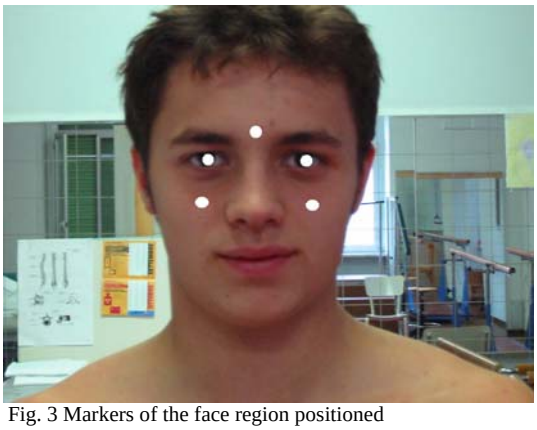

Fig. 3 Markers of the face region positioned

Fig.4 3D image bone, right, left and glabella bones
Image acquired with multislice volumetric CT with volume rendering algorithm.

Neck

In the clavicular region, starting from the sternoclavicular joint and moving laterally with digital palpation, we reach the acromioclavicular joint which is located at the end of the clavicle. The rectangular acromion must be detected in its anterior portion (right acromion and left) and marked v.figg.5,6,7.

Fig. 5 Bidigital palpation of the right clavicle

Fig. 6 Positioning of marker on right acromion

Fig. 7 Marker on the right acromion in lateral view

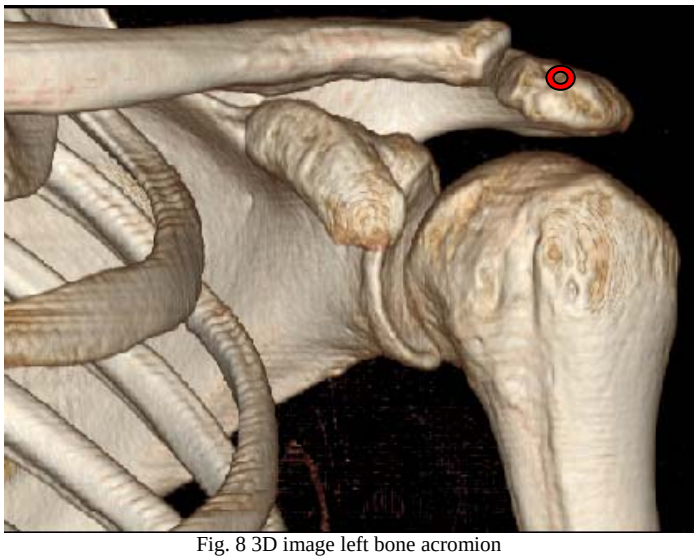

Fig. 8 3D image left bone acromion

Chest

The sternal region, located in the median part of the anterior wall of the chest and corresponding to the sternum, must be identified. Important points of reference are:

1. the jugular notch
2. the sternoclavicular joint
3. the basis of the xiphoid process, v.figg.9,10,11,12,13,14.

At the bidigital palpation (with the fingertips) at the base of the neck in the middle region, it can be appreciated as a depression (fork of the jugule) that continues laterally on the sternoclavicular joint which can be appreciated as a slight prominence, and must be marked .

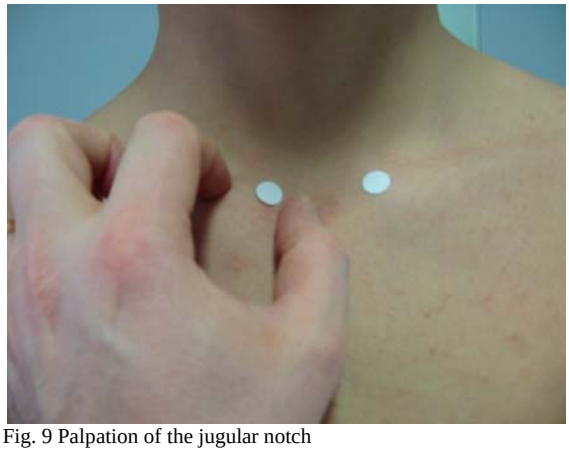

Fig. 9 Palpation of the jugular notch

Fig. 10 Positioning of the marker on the clavicle-sternum

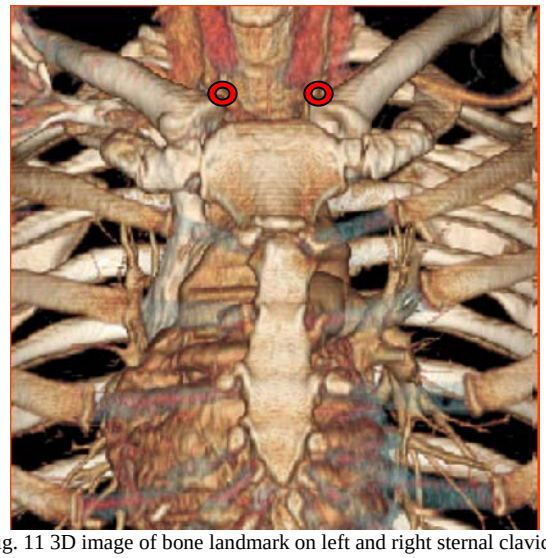

Fig. 11 3D image of bone landmark on left and right sternal clavicle

From the middle point of the fork, the sternum can be divided into two right and left halves by tracing a vertical line called mid-sternal that joins the base of the xiphoid process.
This is identifiable as a median prominence, and is palpable under the skin and brings together the two right and left costal hemiarchs. It must be marked.

Fig. 12 Palpation of the xiphoid process

Fig. 13 Positioning of the skin marker

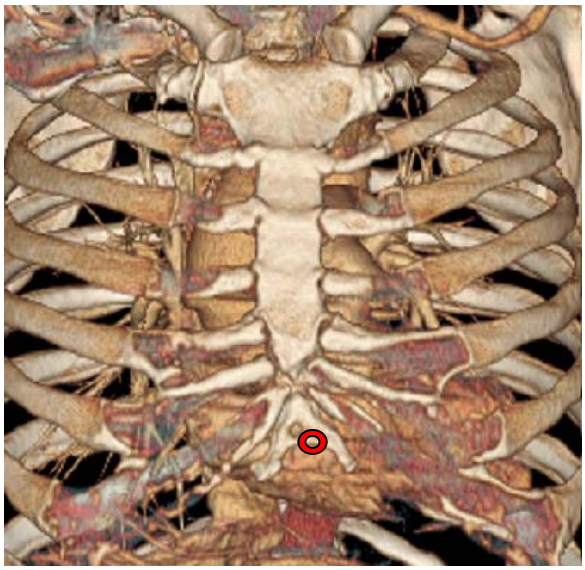

Fig. 14 Image 3 D bone landmark on xiphoid process

The bone landmark is the radial styloid and the ulnar, right and left, see figg.15,16,17,18,19,20,21. Both are to be marked.

Fig. 15 Search for the right radial tubercle

Fig. 16 Bilateral positioning of the markers

Fig. 17 Searching for the left ulnar styloid

Fig. 18 Marker positioned on the ulnar styloid

Fig.19 Immagine 3D repere osseo su stiloide ulnare e radiale , di fronte

Fig.20 Immagine 3D Repere osseo su stilode radiale

Fig. 21 3D image of bone bone on ulnar styloid

Hip bone

The anterior superior right and left iliac spines (SIAS) respectively (see fig. 22,23) are well palpable in lean subjects (less in the obese), such as two equal and usually at the same level bone protrusions. They must be marked.

Fig. 22 Palpation of the right SIAS and marker positioning

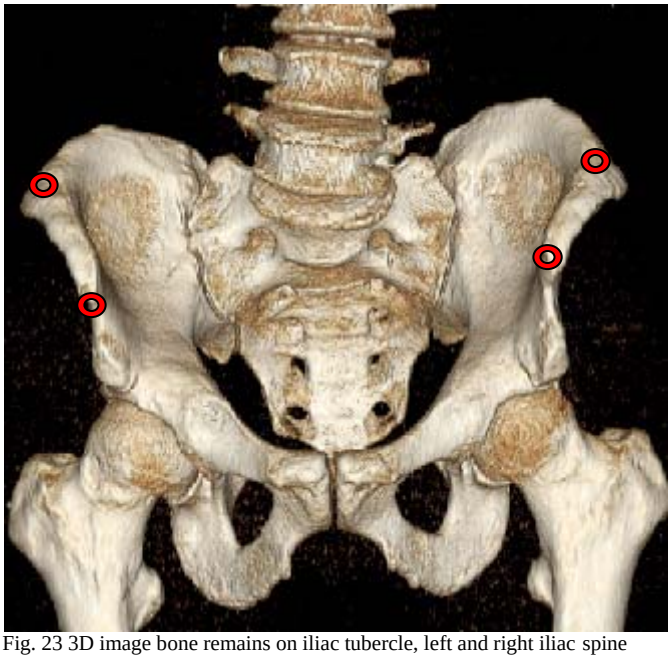

Fig. 23 3D image bone remains on iliac tubercle, left and right iliac spine

Knee

In the anterior region of the knee, the contours of the patella must be palpated in order to mark its center (center) on the right and left, see fig. 24,25,26,27.

Fig. 24 Search for lateral and medial patellar edge

Fig. 25 Search for upper and lower patellar edge

Fig. 26 Centered positioning of the marker

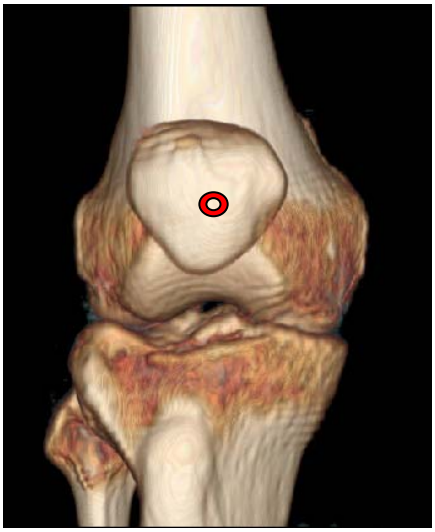

Fig. 27 3D image of a patella

Foot

At the two feet, the nail wall of the 1st toe of the right and left foot must be identified and marked respectively v. Fig. 28,29,30,31

Fig. 28 Positioning of markers on the nail rim

Fig. 29 Anterior view of the finger and malleolus markers

Fig. 30 3D image of the bone on the head of the 5th ray

Fig. 31 Repere of the big toe

Fig. 32 3D image of the same landmarks seen from above

Fig. 33 Front view with all the markers positioned

Sagittal view right and left

Upon observation, it must be noted whether there is an alignment of the occiput-shoulder blades-buttocks-heels. It must be observed if the head and shoulders are anterior or posterior.

In the trunk, note the increase or decrease in kyphosis and lordosis. For the pelvis, the ante or retroversion. v.figg.34,35

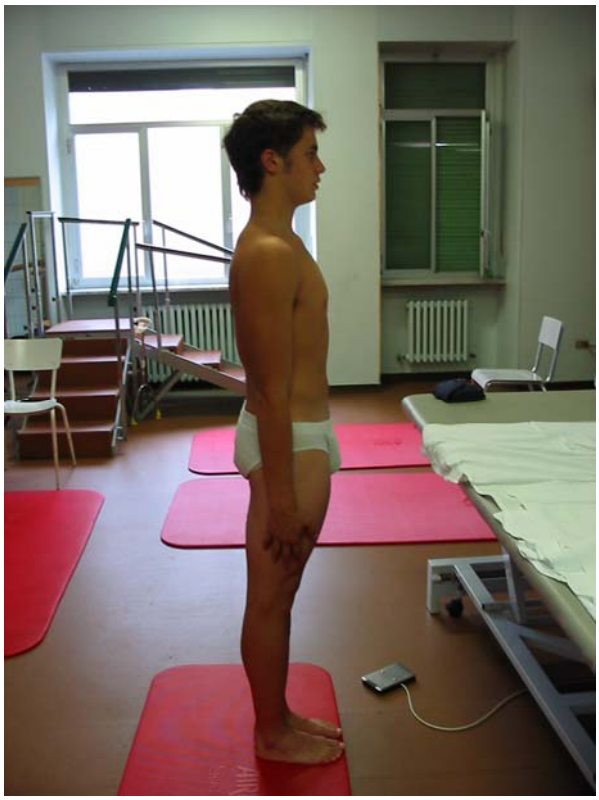
Fig. 34 Global view from the right side

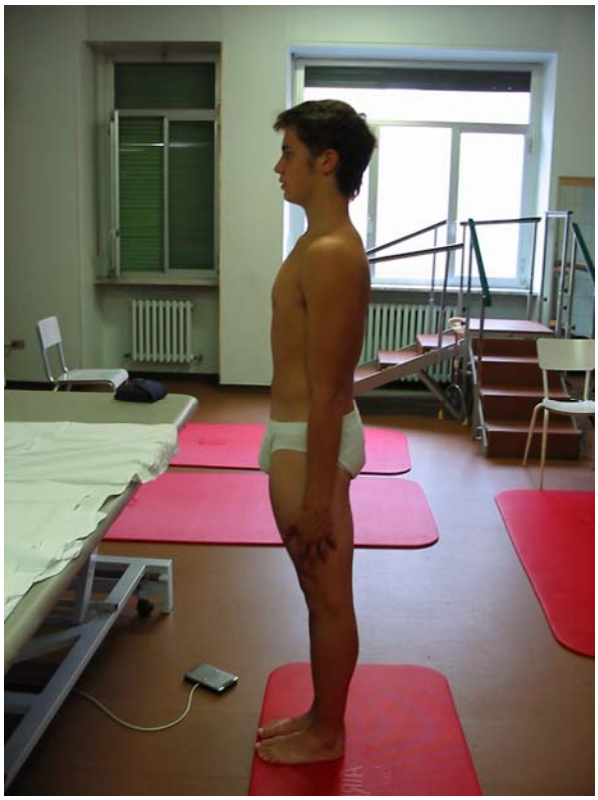
Fig. 35 Global view from the left side

The regions to be analyzed are the auricular, deltoid, pelvis, knee, malleolar, and foot.

Ear

The right and left antitragus is identified, see figg. 36,37


Fig.36 Vista laterale


Fig.37 Segnatura con marker dell'antitrago sx

Shoulder

As previously mentioned, the right and left acromioclavicular joint is palpated, respectively, see fig. 38, 39.

Fig. 38 Marker on the right acromion

Fig. 39 3D image of bone on lateral acromion

Hip bone

Normally each iliac crest is at the same level as the contralateral. Its palpation is easy with the fingertips and allows starting from the SIAS to reach by going about 8 cm posteriorly from it to the iliac tubercle that marks the widest point of the pelvis on the crests. It must be marked.
For the greater trochanter, leaving the thumbs on the anterior superior iliac spines, moving the last four fingers of the hand laterally, we first go towards the iliac tubercle and then downwards outwards to the greater trochanter, the posterior edge of which is relatively superficial and easily palpable
It is reached by making a compass with the thumbs fixed to the SIAS, at the bottom and on the side. At this point one must appreciate a bone salience and specifically the posterior part of the greater trochanter. It must be marked. Normally the great trochanters lie on the same plane. . (see fig. 40,41,42,43,44,45,46,47)

Fig. 40 Research of the right iliac tubercle

Fig. 41 Positioning of the marker

Fig. 42 Iliac and SIAS tubercle marker right (top to bottom)

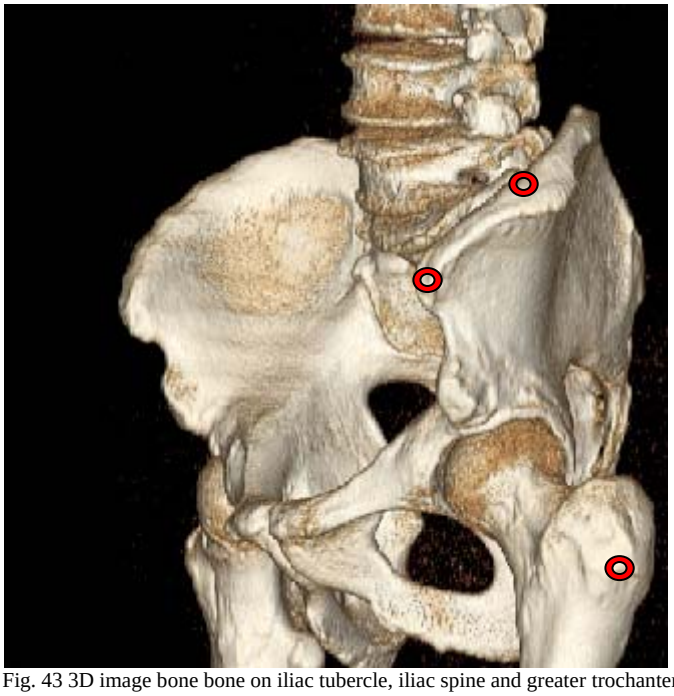

Fig. 43 3D image bone bone on iliac tubercle, iliac spine and greater trochanter

Fig. 44 Research and marker on the right greater trochanter

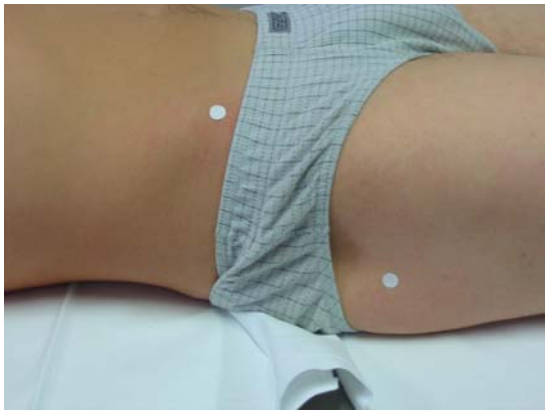

Fig. 45 Marker of SIAS and of the greater trochanter

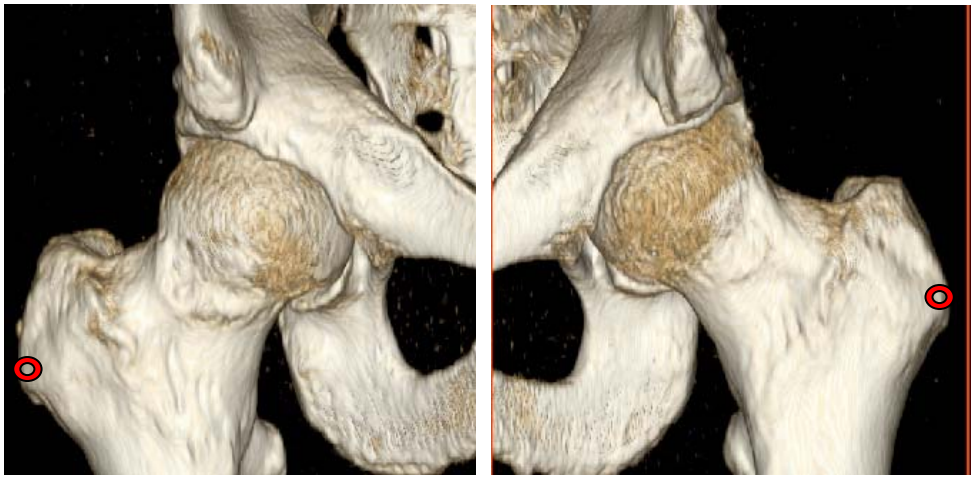

Fig. 46 3D image of the bone landmark on the left and right major trochanter in front view

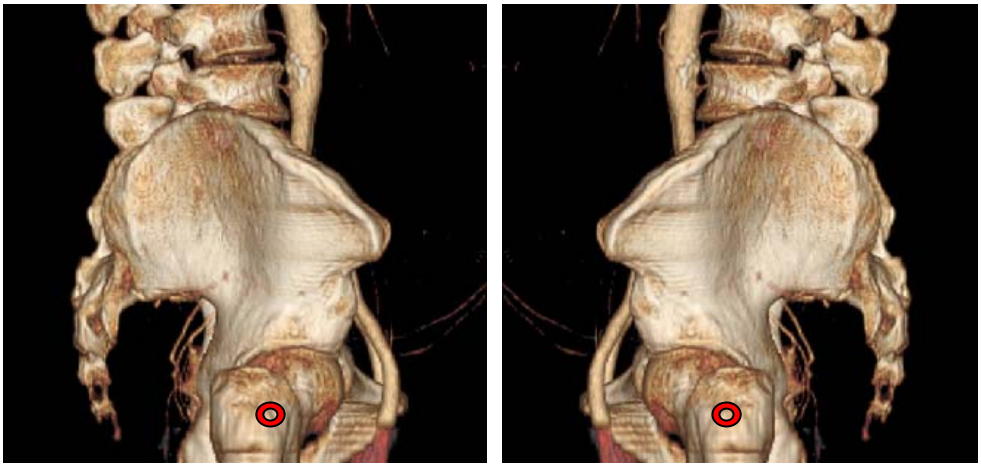

Fig. 47 3D image lateral view of the left and right major trochanter

Knee

Palpation and signature of the lateral and medial femoral condyle (see fig. 48,49) must take place with the patient seated at the edge of the bed with the limbs hanging. In this way the operator sitting in front on a stool fix the limb between his legs and have both hands free for palpation.
In flexion position the skin of the knee stretches over the bones and makes the skeletal landmarks accessible. With the two thumbs on the side of the kneecap they press in the two dimples to the two

sides of the subtotal tendon, moving laterally or medially and upwards, and the lateral and medial epicondyles are found. Mark the side.

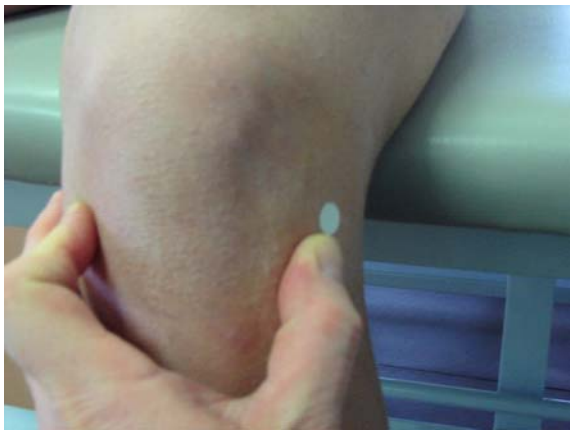

Fig. 48 Palpation of the left lateral condyle

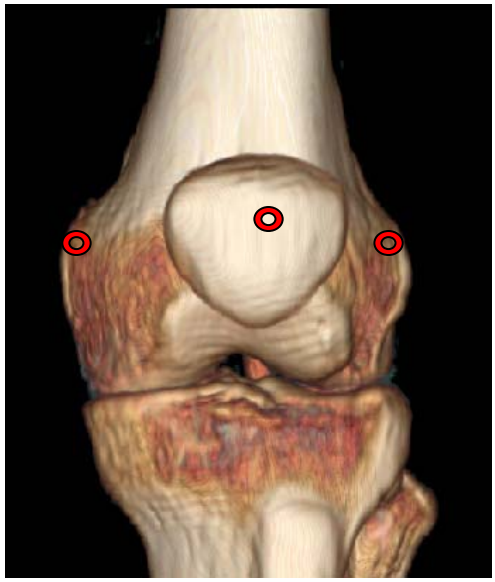

Fig. 49 3D image bony remains, femoral condyles and patella

Leg

The medial and lateral right and left malleoli, see figg. 50,51,52,53

Fig. 50 Search for lateral malleolus center

Fig. 51 Search for medial malleolus center

Fig. 52 A) 3D image bony landmarks medial malleolus

Fig. 52 B) lateral malleolus

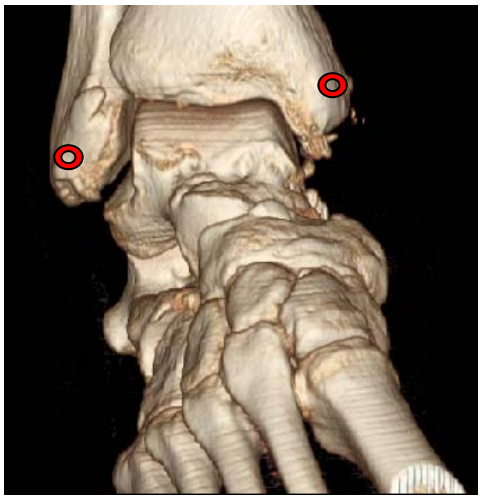

Fig. 53 3D image bony medial malleoli, lateral front view

Foot

Same thing for the head of the 5th right and left metatarsal v.figg. 54,55

Fig. 54 Head search of the 5th right metatarsal

Fig. 55 Apposition marker

Fig. 56 Global right side view with all the markers positioned

Rear view

Fig. 57 Overall rear view

The inspection examination must verify in a standing position:

• Cervical spine: inclinations, rotations
• Shoulders: difference in height
• Trunk: deviations of the spine; symmetry of the triangles of the size
• Hands: difference in height
• Basin: asynclitism
• Femurs: intra-extrarotation; femoral triangle
• Tibias: intra-extrarotation; Tibial triangle
• Feet: varus, valgus

Anatomical regions and palpatory assessments for finding landmarks to be marked are indicated as follows:

• Nape
• Posterior cervical
•Trunk
• Wrist
•Hip bone
•Popliteal
•Yarrow

Posterior cervical

In the posterior region of the trunk a scapular region must be distinguished from a median region. The posterior median region of the trunk has an extension that goes from the skull to the coccyx and includes the spine and the soft parts that cover it. It is divided into the regions of the: neck, back, lumbar, sacrococcygeal. Its surface limits are:

• top: curved line passing through the external occipital protuberance and the upper nuchal line
• below: horizontal straight line passing through the apex of the coccyx.

The scapular region is located between the 2nd and 7th ribs.
The patient is asked to anteflect the neck. In this way the spinous processes of the vertebrae of C7 and D1 are clearly visible, which are to be marked v. Figg. 58,59,60

Fig. 58 Anteflexion of the neck: the epispinoses of C7-D1 are highlighted

Fig. 59 Digital epispiny palpation of C7

Fig. 60 A Markers positioned on C7 and D1

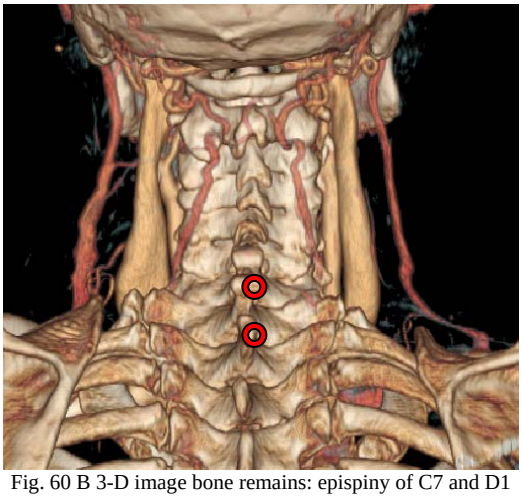

Fig. 60 B 3-D image bone remains: epispiny of C7 and D1

For the dorso-lumbar spine, the patient is asked to position himself prone on the bed with a pillow placed under the abdomen. The head must be placed lower. V. Fig. 61

Fig. 61 Positioning of the marker on D9

Another method (better for obese or overweight patients), the patient is invited to hold a pillow in his arms and abdomen, and while standing, to rest on the cot.

Fig. 62 Positioning in prone with a pillow under the abdomen

In both cases, the epispinous processes of the vertebrae become more evident on inspection and better appreciated on digital palpation.
The following vertebral spinous processes must be searched and marked: D1, D3, D4, D7, D9, D10, L3, L4, S1, S2. v.fig.63,64,65

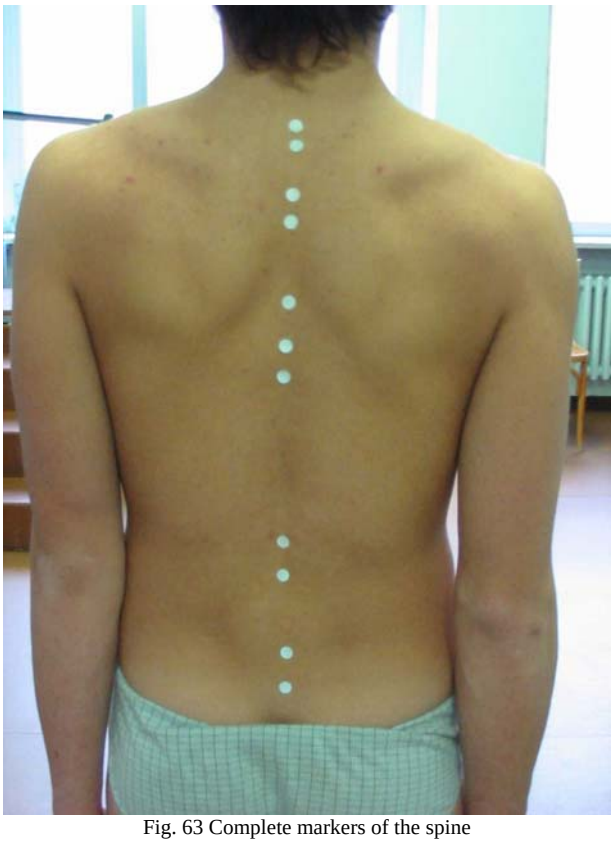
Fig. 63 Complete markers of the spine

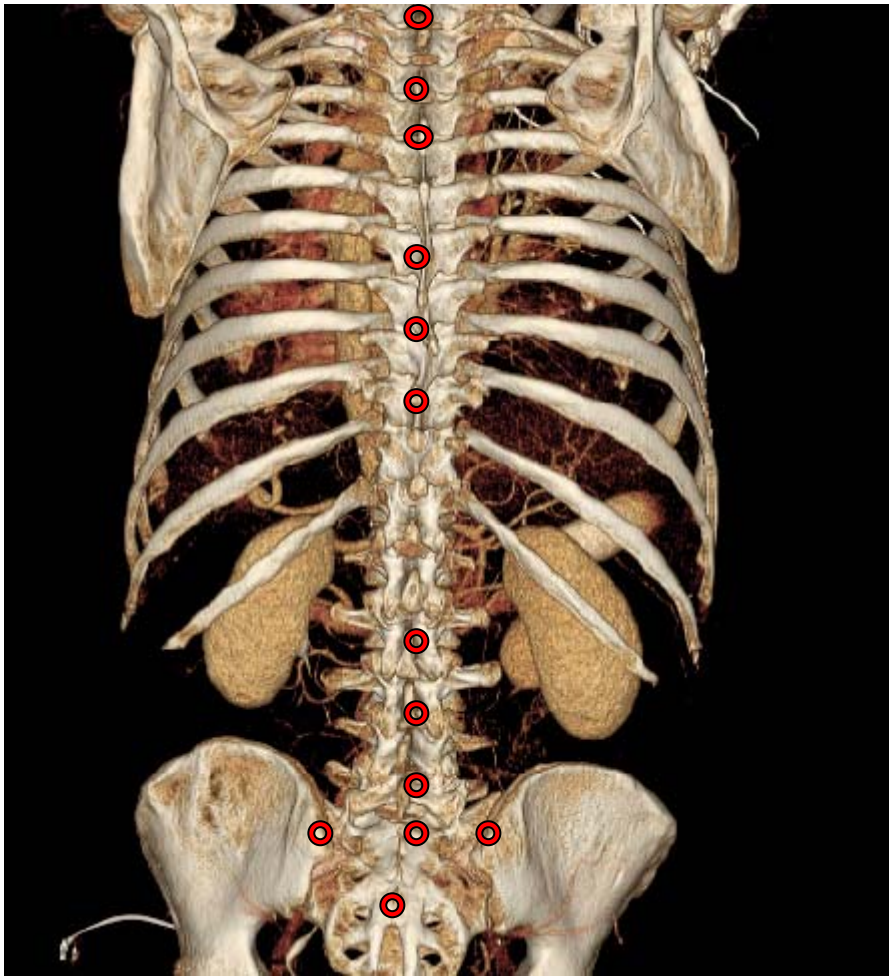

Fig. 64 3D image of bone remains, epispinous from D1 to S2, with left and right SIPS

To identify the epispinosa of D3, remember that palpating the spine of the scapula taking it medially, it is easily encountered at the same level. While the lower corner of the scapula corresponds to the 7th rib, which in turn joins with the 7 ° vertebra.

Fig. 65 3D image Left and right side view of the lumbar spine with bone remains of L4, L5 S1, S2

Hip

It is the segment that connects the lower limbs to the trunk. The upper limit is given by the iliac crest.
The inguinal fold separates it from the lower abdomen. Below, the gluteal sulcus separates it from the thigh region.
In it we distinguish the gluteal region and the inguofemoral region.

The gluteal region has as its upper limit the iliac crest, at the bottom the glute-femoral sulcus, laterally and forward by a vertical line that descends from the anterior superior iliac spine and goes behind the greater trochanter, medially and back from the intergluteal rhyme that continues as a curved line to the two upper posterior iliac spines.
For landmarks, palpation can be performed standing or lying down.
An imaginary line that joins the highest points of the two iliac crests, crosses the vertebral column between L4 and L5 .v.fig.66


Fig. 66 The thumbs reach the L4 episinosa

Starting from the anterior superior iliac spine and skirting the iliac crest which is subcutaneous, we arrive at the posterior spines.
The posterior iliac spines: they are easily available as they lie immediately below the dimples that are above the buttocks .v.figg 67,68,69,70.


Fig. 67 The thumb is on the left SIPS


Fig. 68 Marker on the left and right SIPS

In turn, a line drawn between the SIPS meets S2.

Fig. 69 Marker on S1 and S2

Fig. 70 Marker on L4, L5, S1, S2

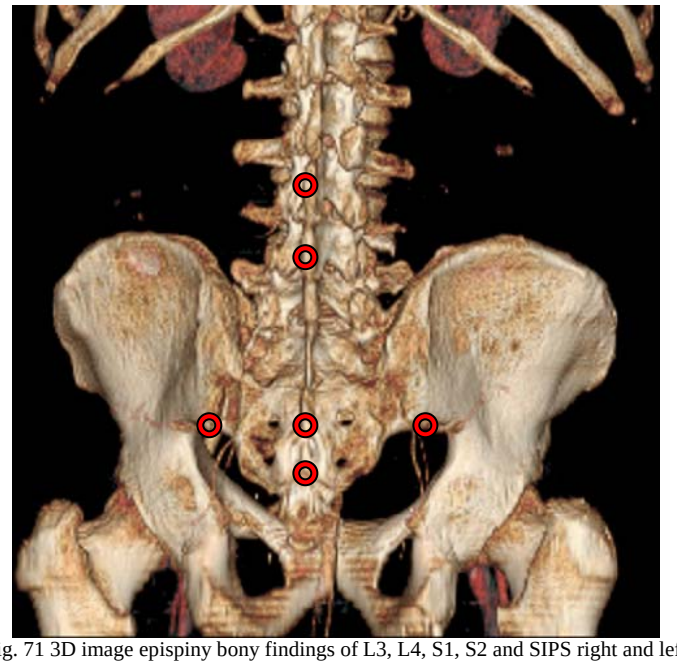

Fig. 71 3D image epispiny bony findings of L3, L4, S1, S2 and SIPS right and left

The popliteal region must then be examined. It identifies the line spacing that joins the two right and left femoral condyles and is marked in the middle with a marker.

Fig. 72 Markers at the left polpliteal line spacing

The yarrow region must be palpated reaching distally the insertion of the tendon, marking its junction both right and left.
Same thing for the left and right heel, with centering of the marker in the middle 5 mm from the heel edge.

Fig. 73 Marker at the yarrow distal insertion and in the middle of the calcaneus

Fig. 74 3D image bone remains for distal insertion of Achilles tendon and calcaneus

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