

Explanation of ISIS2 plots

The date, time, patient's name, date of birth, sex and hospital number are shown along the top of the results page.

Height map:

The height map shows a 3D wire-frame plot. The back is viewed as if the eyes are at hip height looking up the length of the back.

Contour plot:

The contour plot also gives a 3D impression of the back but using contour lines and colour. The lowest contours are blue, running through green, yellow, orange to red at the highest points. The numbers on the contours are in mm and a contour line is plotted every 5 mm. The marker locations are shown (solid blue circles), as are the highest points in the scapula areas of each side of the back (solid blue triangles).

Transverse:

The transverse section plot shows the shape through a transverse section of the back at 19 levels from the vertebra prominens to the sacrum. It also shows the rotation angle, the back length and the skin angle at each section. Rotation is the angle through which the back surface is rotated to make the two PSIS markers lie at equal distances from the reference plane. The skin angle is positive when the right side is higher. The open blue circles are on a fitted curve (a fifth order polynomial) through the markers which is assumed to be the line of the spinous processes. The green and red circles are at the paramedian locations, 10 % of the back length to the right and left of the spinous processes curve. The skin angles are measured between the paramedian points at each level, i.e. over a width of $0.2 \times$ back length.

Coronal:

The coronal plot shows the curve fitted through the markers (thick blue curve) and similar curves at the paramedian locations to the right (green) and left (red). A fine blue line is dropped vertically from the vertebra prominens. The horizontal distance between this line and the sacrum is called imbalance and it is printed at the bottom of the plot. Imbalance is positive when the sacrum lies to the right of this vertical line. The heavy dashed black curve is calculated from the spinous processes curve and the skin angle at each position; it gives an estimate of the line through the centres of the vertebrae (following the ISIS methodology). This line is plotted from 5 % of the backlength above the vertebra prominens to 5 % below the sacrum. The perpendiculars to the points of inflection on the curve are calculated and those within the range of the dashed line are plotted. These are used to calculate the lateral asymmetry or asymmetries (simulated Cobb angle(s)) which are printed below the plot. The vertebra prominens and the PSIS points are shown as solid blue circles. The sacrum is indicated by a magenta diamond.

The black horizontal lines plotted out from the spinous processes line are proportional to the difference in volume between the two sides of the back at each level. The total

volumetric asymmetry is calculated by summing the asymmetries at each level and is printed below the plot. The volumetric asymmetries are also represented pictorially in the bilateral asymmetry maps (see below).

Sagittal:

The sagittal sections through the vertebra prominens and paramedian locations to the right and left are shown. The straight line from the VP to sacrum is presented at the angle of flexion (or extension) measured in the patient. This makes the stance of the patient immediately obvious to the user without needing to read the value for flexion(extension) although the angle is printed below the curves. The magnitudes of the maximum kyphosis and lordosis are shown on the curves in mm, printed at their locations. Kyphosis and lordosis angles are also printed below the plot.

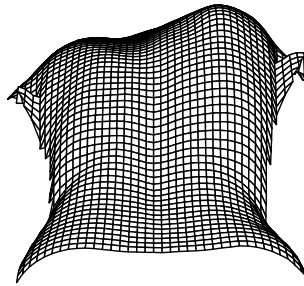
Bilateral asymmetry maps:

These maps present the volumetric differences between the two sides of the back pictorially. The axis of reflection is the curved line fitted through the spinous processes markers. Differences are calculated over a width of $\pm 0.27 \times$ back length in the thoracic region and $\pm 0.2 \times$ back length in the lumbar region, with a smooth transition between the two. The left plot shows all differences between the two sides. If a part of the back is white it means that the other side is higher at that location. The differences range from dark blue at just above zero through green, yellow and orange to dark red at whatever the maximum difference is for the patient. The maximum difference on the left plot therefore varies from patient to patient. The differences are not normalised (at the moment) so a smaller patient may well have smaller differences and yet have a worse curve. Normalisation is planned but more data from patients is needed first.

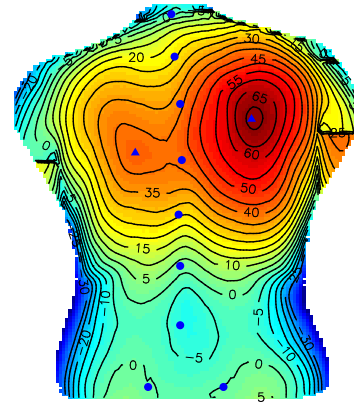
The right-hand plot shows only the differences greater than 10 mm. The darkest red colour indicates a difference of 30 mm or greater between the two sides. This maximum plotted level may be adjusted as more patient data is gathered. The idea is that straight backs should show nothing or almost nothing in this plot and scoliotic backs should show more the worse the deformation is.

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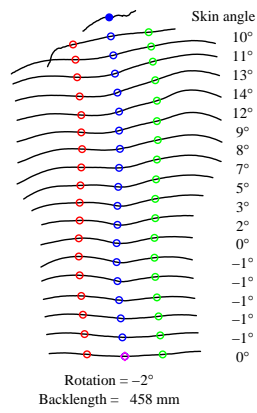
Height map



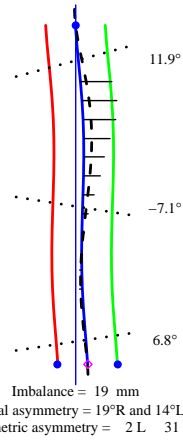
Contour plot



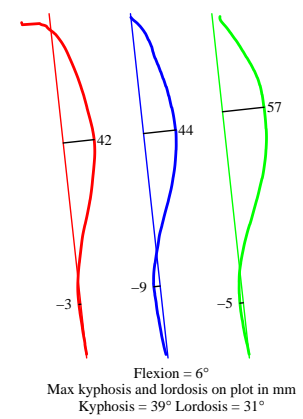
Transverse



Coronal

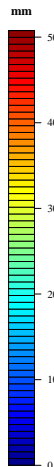
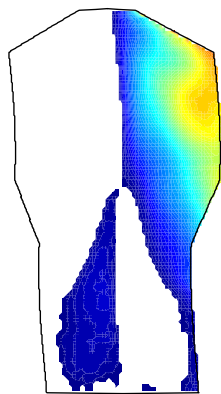


Sagittal



Code3601

Bilateral Asymmetry Map
all differences



Bilateral Asymmetry Map
differences >10mm

