SUPPLEMENTAL MATERIAL

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Shape

We divided the lesions into three disjunctive sets (groups), which means the groups whose elements cannot be contained in more than one set (group). The requirement of disjunctive sets is a necessary condition for relevant quantitative data processing in this research. The quality of "having the same shape" (specified further in the text) was determined to be the feature which induces the formation of the sets of all the lesions that were measured. We discuss the equivalence relation as reflexive, symmetric, and transitive. We denoted the groups as follows: 1 – spherical lesions (shape of a sphere), 2 – elliptical lesions (shape of a spheroid, or ellipsoid of revolution) a 3 – other lesions (some other shape, so anything other from the previous two).

A sphere is a set of all the points that are all the same distance from a given point; the distance is the radius of the sphere and the point is the center of the sphere.

Analogously, an ellipsoid is a solid figure formed by the set of all the points of the space whose position towards the given point (center S) meets the requirements of the equation $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}\leq 1$ in the coordinate system (S, x, y, z), where a, b, and c are positive real numbers determining the half-axis. In the case of our research we have to add the condition that $a = b = c$ is not valid.

A point is not defined but it is said it has no dimensions. Therefore, no existing solid figure can have the shape of an ideal sphere or ellipsoid of revolution, even though it looks like that.

Thus, we need to substitute approximate constructions for the exact mathematical constructions. We will consider any two dimensions of a lesion equal if it holds $0{,}95 < \frac{x}{y} < 1.05$ (they differ by less than 5%). We chose the level of accuracy on the grounds of the possible error in the measurement of the dimensions of a lesion. The accuracy of the measurement can be equal to the accuracy of the calibrated instruments at maximum, which means 95%.

Our first attempt to distinguish the shape of lesions used squared deviation of individual dimensions from their mean. This approach is simple but in the case of small lesions it does not describe their shape properly.

Then we tried to determine the coordinates of the vertices of a section and decide if the vertices lie on a sphere or rather an ellipsoid of revolution or not. This approach is very precise in distinguishing the shape of lesions but the formulas would be too complicated.

Thus, we believe the optimal relation is the one that compares the ratio of the dimensions of lesions. Excel enables us to find the least, k-th largest, or largest value in a set applying the function MIN(cell), LARGE(cell, k). We can order all the dimensions of each lesion according to size and denote them $\leq b \leq c$. Now we can focus on comparison of individual dimensions (supposing that the dimensions were measured as three perpendicular line segments with a common center). If the ratio of the dimensions is $\frac{a}{b} > 0.95 \wedge \frac{b}{c} > 0.95$, we can say (with the chosen accuracy) that it is a sphere. In the worst situation the smallest dimension can differ by 9.75% from the largest one. If we wanted to apply "tougher" criteria, we only had to rewrite the Excel cell of accuracy, replacing 0.95 with a higher number; e.g., in the case of 0.97 accuracy, the worst situation would be 94.09% accurate.

In the event that only one of the conditions is fulfilled, the section of the lesion is a circle and the third dimension is longer or shorter than the diameter. We could then say (with the chosen accuracy) that it is an ellipsoid of revolution. If no condition is fulfilled, we can talk about "other shape". To decide this we used an Excel spreadsheet with the built-in IFS function IF(condition;yes;no). The final command can be written as follows:

```
=IF(MIN(MIN(L5:N5)/LARGE(L5:N5;2);
LARGE(L5:N5;2)/MAX(L5:N5))>$V$3;1;
IF(MAX(MIN(L5:N5)/LARGE(L5:N5;2);
LARGE(L5:N5;2)/MAX(L5:N5))>=$V$3;2;3))
```