Image Registration Methodology To Quantify Rois' Volume Transform Accuracy
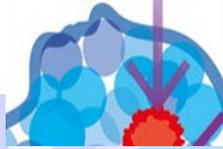
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Introduction

- Medical images registration is the process of superimposing two or more images of the same scene taken at different times, from different points of view, and / or by different sensors.

- Rather recurrent problem is a noticeable change in patient's anatomy during the normal course of his radiant treatment. This situation requires a new CT scan to go through a second or third stage in the treatment planning.

- Three goals are to be achieved using a free computational tool "3D Slicer":

  1. To obtain suitable reference frames to merge tomographic images obtained in different stages and / or positions;

  2. To find a correlation between the volumes of organs at risk from both sets of tomographic images through the use of co-registration and image fusion methods;

  3. To obtain a systematized tool that allows to make this comparison of volumes involved.

Results I

1: Geometric Transformation

2: Registration flow
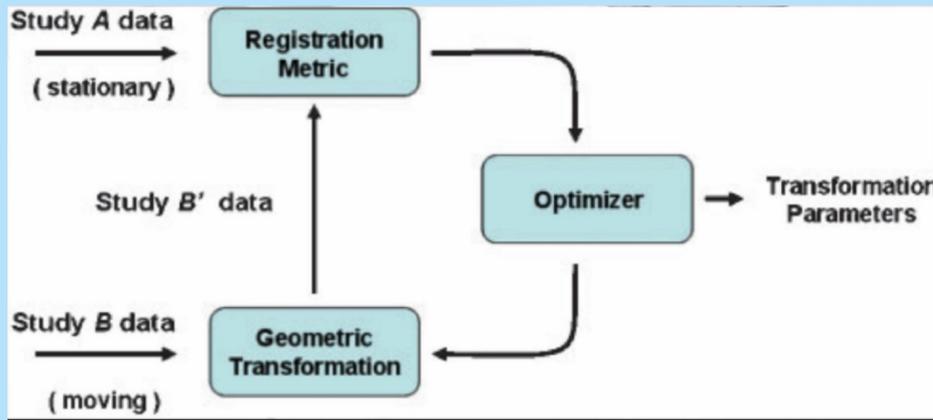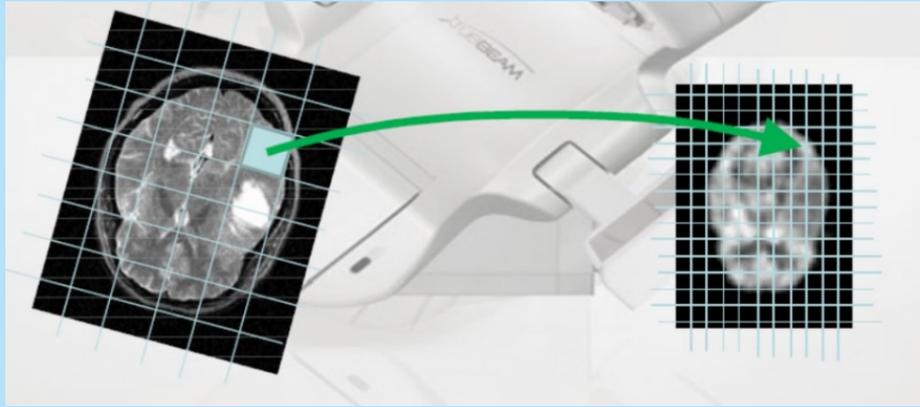
- Some IR algorithms are sensitive to deformations induced by the applied transformations:

- General Registration (BRAINS),

- Semi-automatic register

- *Affin* Transformation,

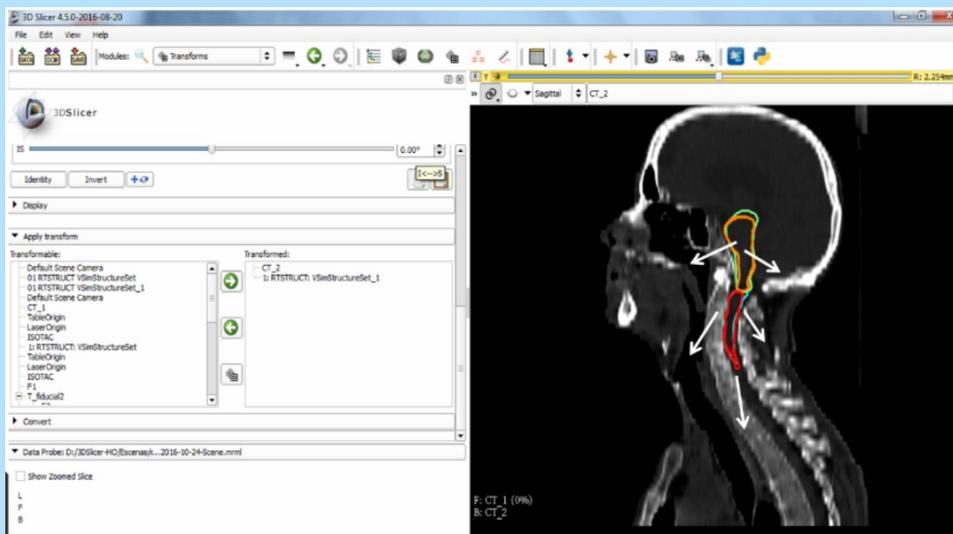 All of above were discarded for being unreliable.

Results II

- $EV\% = 100 * \Delta V/V$

Antes de Registro de superficie

Interfaz de registro de superficie

El resultado después de la inscripción de superficie

Ev% range from 1% to 6% in H&N

And from 3% to 13% in Pelvis

- The EV% calculation method demonstrated to be a versatile and simple tool for the quantification of the accuracy of the registration process and its transformation;

- it is possible to contrast the results obtained in unexpected volume changes (ROIs) in the transformations, as well as in the selection of the chosen registry:
  - Fiducial and Surface Registration were choosen (with Rigid and Similarity transformations) Caption

Discussion/conclusions

- It was obtained the reference' frames and quantify the accuracy of the probable measurement as well as the precision of a registration algorithm and its transformations, from the study of structures of organs at risk.

- The results could open the way of subsequent analyzes linked to

  - Dose Volume Histograms (DVH),

  - dosimetric validation by measurements and

  - the use of other software (e.g. FIJI or MathLab) to verify the reproducibility of the results.