The effect of closing approach during carotid endarterectomy

Background
The carotid bifurcation tends to develop atherosclerotic stenosis which might interfere with cerebral blood supply and can cause coma, hemodynamic disturbance, stroke and even death. The common clinical solution is to remove the plaque via surgery (Fig. 1). The repaired artery is closed by primary closure or patch.

Project Goals
Our motivation in this study is to examine the hemodynamics and biomechanical aspects of patch procedure in comparison with primary suture, using numerical methods.

Methods
In our research we used numerical methods, with ADINA program, to explore and compare the two solutions in terms of hemodynamics, stress and flow patterns developed in the artery wall. We used validation tests to determine the time step to be 0.035 sec and the element length of 0.05 cm.

Results

Conclusions
In the suture case the vortex is small, the shear stress are higher and the von-Mises stress map are most similar to the healthy artery. According to all the examined properties, the approach with the suture is preferred.