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Deformation of Dorsal Root Ganglion Due to Pressure Transients of Venous Blood and Cerebrospinal Fluid in the Cervical Vertebral Canal

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1 Deformation of Dorsal Root Ganglion Due to Pressure  
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7 **Abstract**

8 The dorsal root ganglion (DRG) that is embedded in the foramen of the cer-  
9 vical vertebra can be injured during a whiplash motion. A potential cause  
10 is that whilst the neck bends in the whiplash motion, the changes of spinal  
11 canal volume induce impulsive pressure transients in the venous blood out-  
12 side the dura mater (DM) and in the cerebrospinal fluid (CSF) inside the  
13 DM. The fluids can dynamically interact with the DRG and DM, which are  
14 deformable. In this work, the interaction is investigated numerically using  
15 a strong-coupling partitioned method that synchronize the computations of  
16 the fluid and structure. It is found that the interaction includes two basic  
17 processes, i.e., the pulling and pressing processes. In the pulling process, the  
18 DRG is stretched towards the spinal canal, and the venous blood is driven  
19 into the canal via the foramen. This process results from negative pressure  
20 in the fluids. In contrast, the pressing process is caused by positive pressure  
21 that leads to compression of the DRG and the outflow of the venous blood  
22 from the canal. The largest pressure gradient is observed at the foramen,

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