工程与应用

基于IVUS影像的血管壁局部应变计算方法

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摘要　动脉血管弹性是反映人体血管系统好坏的重要指标，分析血管壁弹性对早期识别易损斑块、防治心血管疾病具有重要意义。而弹性又以一定力作用下血管壁产生的应变来衡量，研究管壁应变的精确计算方法成为判定血管弹性的关键。在血管内超声图像的基础上，利用有限单元法对血管壁区域进行三角形网格划分，以三角形单元为基础求解血管壁平面二维应变的三个分量，即沿x轴、y轴方向的线应变（正应变）和线段夹角的改变量（切应变）。与一维应变相比，二维应变不仅提供了更多的应变参考数据，还将相邻点之间的形变影响因素也加入到计算中，提高了计算精度。实验计算数据也表明二维应变的分析结果与血管壁区域像素点的实际运动相符合。

关键词　 应变　 血管内超声　 有限单元

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Method of calculating local strain of blood vessel wall based on IVUS image

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Abstract

The elasticity of the artery is the important standard in judging blood vessel system，detecting plaque vulnerability and preventing blood vessel diseases.The elasticity is measured by the strain of blood vessel wall aroused by the force.Computing the strain of the blood vessel accurately is the key to judge the elasticity.The vessel wall is divided into many triangles by finite element at the foundation of IVUS image.In the two-dimension plane，three values calculated by the triangle element are line strains along x-axis and y-axis（positive strain） and the changing of the angle between lines （shear strain）.Compared with the one-dimensional strain，the result indicates that two-dimensional strain provides more references，adds the influence between adjoining dots and improves the accuracy.The experiment data proves that the analysis of two-dimensional strain fulfills the moving of the pixels in blood vessel wall.

Key words 　 strain　 ivus　 finite element

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