VISIBILITY DIFFERENCES WITHIN THE DIAGNOSTIC CATHETER

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1. Introduction

Catheters are used in every day in the interventional cardiology. It is used to deliver radiopaque media and therapeutic agents to the desired sites in the vascular system [1-3].

The most of the interventional procedures is practiced under X-ray fluoroscopy; therefore the diagnostic catheter can be visible under X-ray fluoroscopy. The diagnostic catheters don't have sufficient X-ray contrast because it has lower number of elements, such as C, H, O and N [4-6]. The wire braid in the wall of the diagnostic catheter may provide or increase the radiopacity of the diagnostic catheter [5,7].

Our aim was to determine that the wire mash really increases the radiopacity. The first step of this research work was to work out a measurement method, which is adjusted by the standard ASTM F640-12 [8] and our earlier studies [9,10]. In this study the visibility of one diagnostic catheter with and without wire braid part were determined, quantified and compared to each other.

2. Materials and methods

The end of the investigated catheter which is introduced into the cardiovascular system is shown on Figure 1. The visibility of this end's parts were quantified and compared.

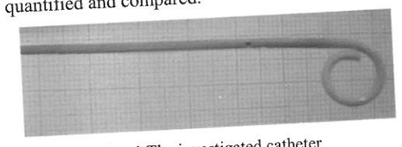

Fig. 1 The investigated catheter

X-ray microscopic photo were made from this part by Dage XiDAT XD6600 X-Ray Inspection System (Figure 2a, Figure 3a).

The visibility was determined by a software, which was developed in our research group and was written in C programming language. The density differences between the sample and the background were calculated from two X-ray photos, with 8 bit. One photo contained the part of the diagnostic catheter and one contained the background (Figure 2, Figure 3). The part without wire braid was investigated from 8 mm to the end of the tip and with wire braid was from 3 mm to the distal end of the wire braid.

After the quantification of the parts visibility it was compared to each other, and analyzed with descriptive statistic.

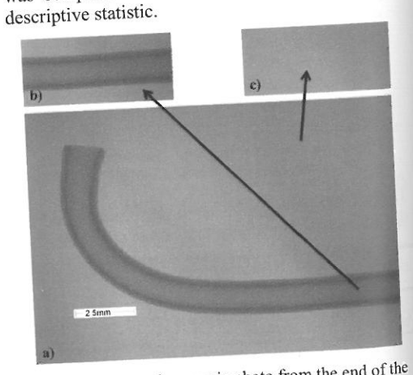

Fig. 2. a) X-ray microscopic photo from the end of the diagnostic catheter b) the investigated part without wire braid c) the investigated part of the background

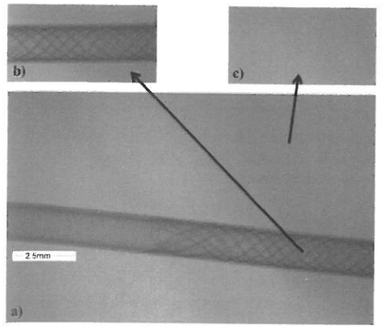

Fig. 3. a) X-ray microscopic photo from the start of the diagnostic catheter b) the investigated part with wire braid c) the investigated part of the background

3. Results and Discussions

The visibility of the parts with and without wire braid is shown on the Figure 4.

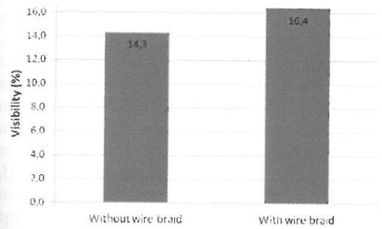

Fig. 4. The visibility of the diagnostic catheter's investigated part

The difference of the two values is 2.12%, their average is 15.3%, and the standard deviation is 1.5%. The coefficient of variation (relative standard deviation) was 0.01, therefore the homogeneity of the sample (the investigated part) was low heterogeneity, but not clearly homogeneous.

4. Conclusions

Our new measurement method is suitable for the determination and comparison of the visibility of the diagnostic catheter's parts with, and without wire braid. These values may different according to the literature.

Acknowledgements

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