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Short communication

Post mortem introduction of corrosion cast method after coronary stent implantation

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Abstract

We have firstly presented a case using post mortem corrosive method in forensic medical practice after coronary stent implantation. Occlusions, fate of side branches could be detected during the clinical diagnostic angiography, intravascular ultrasound, computed tomography; however, the forensic medical determination of cause of death, identification of complications needs a careful post-mortem investigation. The injection-corrosive method seems to be a useful assistance in the characterisation of pathomorphological changes after stent implantation. Besides the classical techniques of histology, immunohistochemistry, electron microscopic investigation we have introduced a new synthetic resin corrosion cast method. This three-dimensional corrosion cast preparation may provide new data about the actual morphological condition of the coronary vessels and a better understanding of the pathomechanisms of sudden cardiac death after percutaneous coronary intervention.

Keywords: Stent implantation; Corrosion casting; Coronary occlusion; Atherosclerosis; Side branches; Medico-legal investigation

1. Introduction

The first implanted stent was described by Dotter [1] to treat arterial shrinkage. Percutaneous coronary intervention was introduced, and the clinical routine implantation began in the 1990s [2]. Bare-metal stent and drug-eluting stent with a number of adjunctive pharmacologic modalities were developed, and they are nowadays routinely and successfully used [3,4]. The procedure of stent implantation is well established. The stent is collapsed to a small diameter, placed over an angioplasty balloon catheter and moved into the area of the blockage. When the balloon is inflated, the stent expands and deforms plastically, locks in place and forms a scaffold to hold the artery open [5]. The diagnostic performance of conventional coronary angiography, high-resolution multislice spiral computed tomography, intravascular ultrasound after coronary stenting were evaluated in clinical studies [6,7].

Tremendous scientific progress has been achieved in the field of cardiovascular surgery, and the clinical investigations have several achievements. However, the post mortem investigation of the fatal complications remains a challenge for forensic pathologists. Research at the field of medico-legal evaluation of complications after intravascular stent implantation is still necessary. The post mortem results of forensic autopsies may have a role in the future developments of coronary stents in particular to improve the design and to reduce the long-term failure.

Besides the classical pathomorphological examinations, histology, immunohisochemistry, electron microscopic investigation; corrosion cast preparations [8–10] for the detection of coronary anomalies have not been frequently used in forensic practice. Classical methods usually show the changes or illnesses directly, however, the corrosion cast technique needs an inverse attitude of forensic pathology in the detection of arterial changes.

We firstly present a case using post mortem corrosion casting method in forensic medical practice after coronary stent implantation.

2. Materials and methods

Between the Department of Forensic Medicine and Department of Human Morphology and Developmental Biology of Semmelweis University, collabora-

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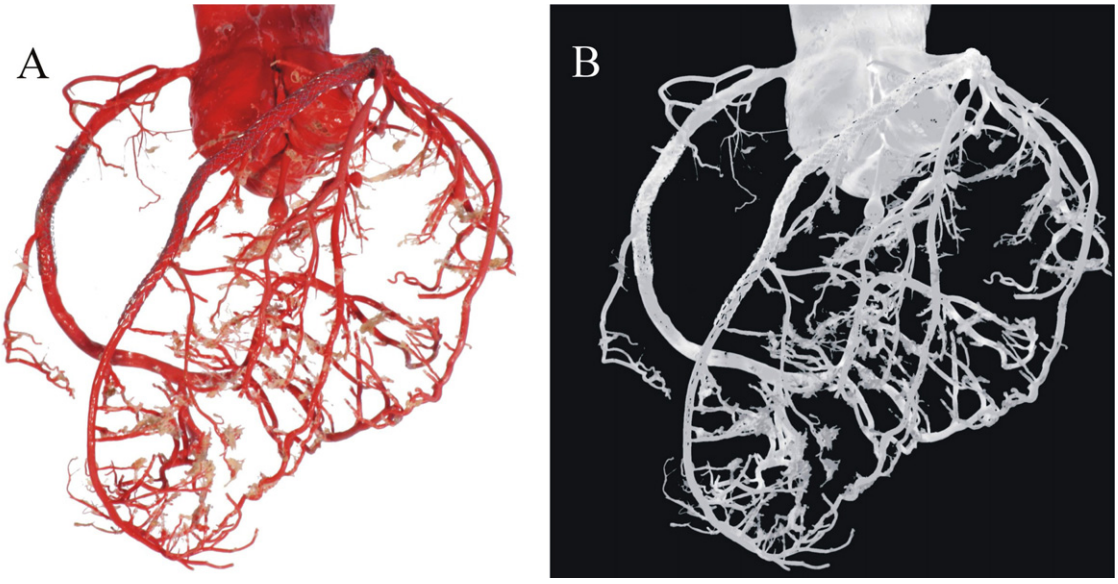

Fig. 1. Corrosion cast of the coronary system. (A) original colour of the cast, (B) black and white version.

tion was started to examine the three-dimensional morphology of coronary vessels by the injection of casting material.

A new corrosion material (Mediresin R1) and casting method (developed by Mátyás Kiss) were applied to investigate the three-dimensional structure of coronary vessels. The heart was removed within 48 h after death and the ascending aorta was cannulated. Subsequently, 45 ml of red coloured resin was injected through the cannula of the ascending aorta. The viscosity of the resin was adjusted according to the diameter of the vessels by an additive substance (Mediresin Medipowder). The preparation solidified (polymerisation) approximately 15 min after injection. When the injected resin became hard, the specimen was immersed in hydrochloric acid solution (cc. 30–33%). Three days later the macerated heart was carefully irrigated and the air-dried vascular corrosion cast was examined macroscopically.

In this short communication, we firstly present a preparation with two coronary stents (56 year-old male victim) visualised by this corrosive method. We took photos of the macroscopic preparation from every 2.5°, and put together the 72 pictures. A three dimension figure by Corel Photo Paint professional computer program was produced.

3. Results and discussion

We examined the coronary system by post mortem injected-corrosive method (Fig. 1) in a 56 year-old male victim, who died by a car accident after two years of coronary stenting. Fig. 1A shows the cast of corrosive plastic material injected into the coronary arteries. The colours of this picture were inverted into black and white (Fig. 1B) for the purpose to imitate the characteristics of a coronarogram made by the clinicians during the medical diagnostic procedures.

As far as we are aware the present study is the first to provide data on the application of cast corrosion technique in the

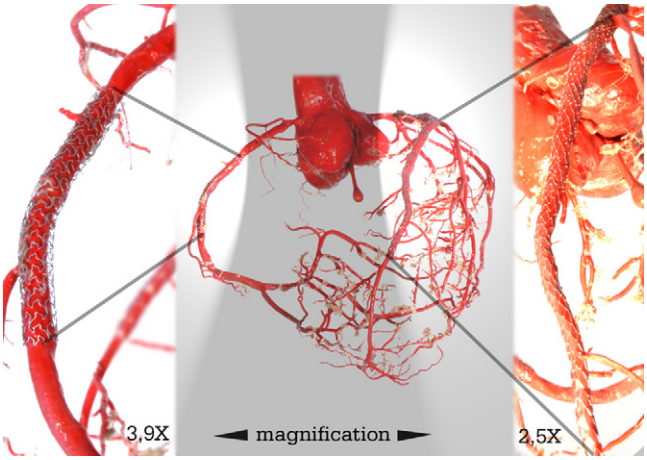

Fig. 2. Implanted stents on the surface of the vascular cast of the right and left coronary arteries.

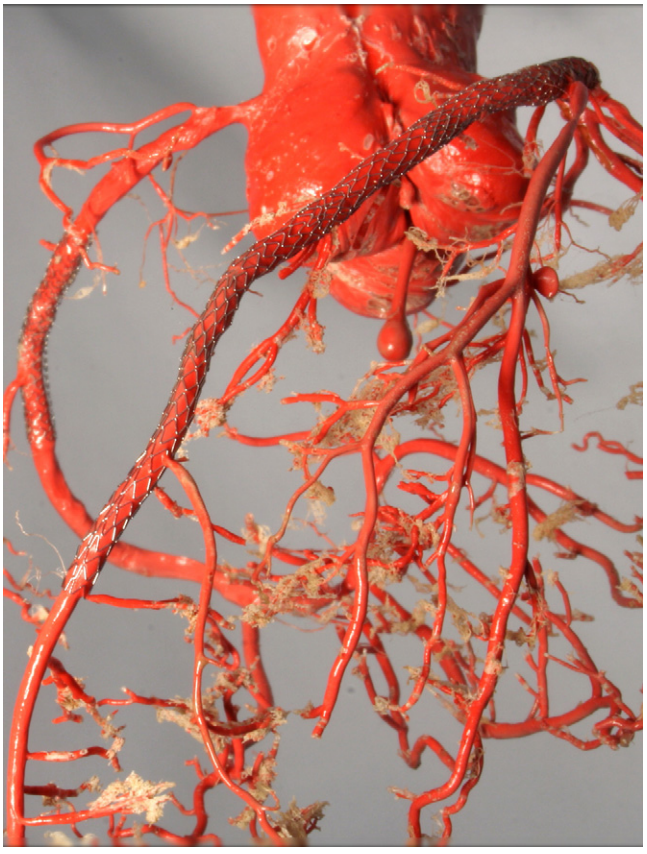

Fig. 3. Few side branches in the stented regions of coronary arteries.