International Journal of Anatomy and Research,
Int J Anat Res 2017, Vol 5(4.2):4620-22. ISSN 2321-4287
DOI: https://dx.doi.org/10.16965/ijar.2017.422

Original Research Article

VASCULAR INJECTION TECHNIQUE BY RTV 116 SILICONE RUBBER

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ABSTRACT

Introduction: The in depth knowledge of the vascular supply to various parts of the human body, especially its terminal branches, is of utmost importance to the surgeons. Visualisation of the branching pattern of the arteries, its terminal branches and variations may be difficult as the calibre of the vessel decreases. Tracing such minute vessels during routine dissection is not easy and can be laborious.

Aim: To demonstrate the uses and advantages of the silicone compound RTV 116 in studying arteries along with its terminal branches, which are of minute calibre and also its pattern of distribution which are normally not visible during routine dissection by a simple vascular injection technique.

Materials and Methods: In this study the superior mesenteric artery and axillary artery is injected with silicone compound RTV 116.

Results and conclusion: The silicone compound RTV 116 which is injected into the arteries passes easily through the vessels and its minute terminal branches. These minute vessels are less than a millimetre and these vessels are clearly visible. Since the silicone compound is red in colour these vessels appear red with good contrast.

KEY WORDS: Superior Mesenteric Artery (SMA), Axillary Artery (AA), RTV 116 Silicone Rubber (SR).

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Access this Article online

Quick Response code

DOI: 10.16965/ijar.2017.422

Web site: International Journal of Anatomy and Research
ISSN 2321-4287
www.ijmhr.org/ijar.htm

Received: 17 Aug 2017
Peer Review: 17 Aug 2017
Revised: None

Accepted: 03 Oct 2017
Published (O): 01 Nov 2017
Published (P): 01 Nov 2017

INTRODUCTION

Vascular anatomy forms the basis of graft surgeries. The knowledge of the vascular network makes it easier for the surgeon to determine the type and extent of the flap to be used. The branches from the main arterial trunk progressively become smaller as successive branches are given off from the main branches. The terminal branches are narrower and cannot be easily distinguished by the naked eye. It becomes difficult to demonstrate such minute vessels during routine dissection. Vascular injection techniques are useful in demonstrating the minute vessels, which are not normally visible during routine dissection. Different compounds have been tried with limitations in viscosity, colour, application, storage and handling. This study aims to demonstrate the terminal branches of the artery and its territory, which can be visualised using a novel silicone based compound via a simple injection technique.

MATERIALS AND METHODS

Room Temperature Viscosity 116 (RTV116) is a red flowable silicone compound available as 100

ml tube. It is a ready to use silicone sealant that transforms into a tough resilient silicone rubber (SR) on exposure to atmospheric moisture at room temperature. It can withstand extreme temperatures and chemical attacks. It is mainly used for industrial purposes for bonding metals, plastics, ceramics, glass and other substrates.

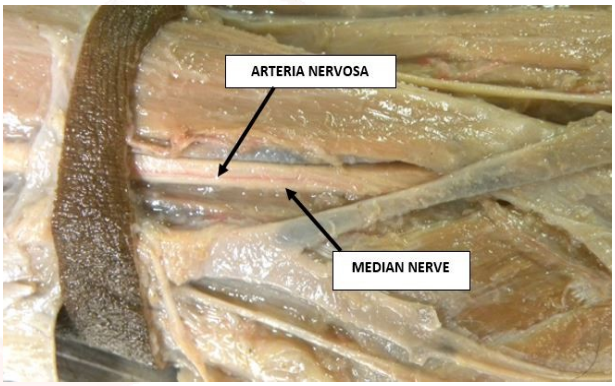
During routine dissection of the abdomen, the superior mesenteric artery (SMA) is exposed. The content of the RTV 116 tube is transferred to a 50 ml syringe and this is injected steadily into the SMA. The same procedure is carried out for injecting into the axillary artery, which is exposed in the axilla. The silicone easily passes into the main branches and then into the minute branches and the procedure is carried out till the SR fills the terminal branches which are easily visible due to the red colour of the silicone sealant. This is kept 24 to 48 hrs for hardening. Further dissection is carried out and minute branches of the terminal branches can be identified and separated from other structures. These terminal branches and its pattern can be recorded and studied.

RESULTS

The application was very simple and easy to administer the SR. During the procedure there was no spillage or leakage of the SR. Since the SR was red in colour there was no need for mixing any colour pigment before administration. The SMA could be easily dissected after the injection of the silicone compound. The branches of SMA were separated without any damage to the adjacent tissues. The red colour and firm rubbery consistency of the silicone compound facilitated dissection. The pattern formed by the terminal anastomotic arches and then straight vessels of the SMA (Fig A), which are normally not visible during routine dissection was clearly visible after injecting. After injecting into the distal part of the axillary artery, the dissection was carried out on the arm, the muscular branches of the brachial artery and the cutaneous branches of the skin were clearly seen. It was also noted that some of these cutaneous vessels were the continuation of the muscular branches which emerged after supplying the muscles. The most interesting feature was that the arteries supplying the nerves could be seen, for example, the artery supplying the median nerve (Fig B) and radial nerve could be seen. The vessels less than a millimetre were clearly seen.

Fig. 1: Superior mesentric artery and its branches.

Fig. 2: Artery supplying median nerve – arteria nervosa.



DISCUSSION

The vascular injection technique is very useful in studying the vascular territory as it helps the surgeons in planning the extent of the flap or the graft to be used for the surgery. In 1999, McKinnon and colleagues, performed intraarterial ink injections and subtraction angiography plus latex injection, to define the vascular anatomy of the posterior auricular artery [1].

Houseman and co-workers (2000) preferred to use a lead oxide/gelatine solution, but after adequate perfusion into each vessel, they cooled the cadaver overnight to ensure solidification of the gelatine and lead oxide [2]. Malikov S et al (2005) during the study on thorocodorsal axis injected Rhodorsil before dissecting and the total length of the arterial graft that preserved an external diameter above 2 mm was measured [3]. Francesco Manna et al (2010) used a mixture of methylene blue (4 ml) and gelatine

powder and waited until this particular gel mixture became thick. Then, the mixture was injected into the external carotid artery and a very good image of the arterial supply of the face was obtained [4].

In our study the required quantity of SR was transferred into the syringe and injected into the artery, which made the application very easy. There was no spillage or leakage. The smaller branches of the artery less than 1mm were very clearly visible. The colour of these branches appeared red since the SR is red in colour. After hardening, further dissection is very easy and the minute terminal branches can be easily separated and the pattern of distribution can be studied. In our study the terminal branches of the superior mesenteric arteries that is the vasa recta supplying the jejunum were clearly visible. The branches of the brachial artery could be visualised and even the artery supplying the median nerve could be seen clearly.

Once the SR is hardened the arterial pattern can be preserved to any length of time, since the SR is resistant to high temperatures.

CONCLUSION

RTV 116 is a flowable red colour SR that hardens due to alteration in it's viscosity when exposed to atmospheric moisture. When injected into the arteries it passes easily through the terminal branches. After 48hrs this compound hardens and helps easy identification of these minute branches. No additional colour agent was required as the SR itself imparted the red colour. The study also reveals the easy application of the SR. Using this compound (SR) and with a simple technique the vascular pattern of different regions can be studied. These studies will throw a light on reconstructive surgeries and to judge the extent of the flap to be used.

Conflicts of Interests: **None**

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How to cite this article:

Martin Lucas A, Pranup Roshan Quadras. VASCULAR INJECTION TECHNIQUE BY RTV 116 SILICONE RUBBER. Int J Anat Res 2017;5(4.2):4620-4622. **DOI:** 10.16965/ijar.2017.422