Magnetic Resonance Imaging Technique of Abdominal Aorta, Vena Cava, and Their Branches—Imaging Time acquired to pick up Those Vessels and Lumbosacral Spine in a Cut

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ABSTRACT

Objective: To look for the proper magnetic resonance (MR) imaging time after intravenous contrast medium administration to map the image of the abdominal vessels and lumbosacral spine together in a cut.

Materials and methods: The utilized MR machines were Achieve 1.5T and 3.0T (Philips, the Netherlands) and cut thickness was 4.0 mm. Contrast medium was Iopamidol (Dongkuk Pharma, Seoul, South Korea). For the vessel image, scan was done at 30 seconds after intravenous Iopamidol administration, and then scans were repeated every 10 seconds to pick up the best imaging time in a cut until 150 seconds postcontrast medium administration.

Results: Aorta and its bifurcation could be imaged at 30 seconds postcontrast medium injection. The best wanted image of all the large abdominal vessels and lumbosacral spine together in a cut was obtained at 70 seconds after contrast medium administration. The best peripheral venogram was obtained at 150 seconds.

Summary: This MR imaging time sequence provided easy access to obtain the large abdominopelvic vessels together with the lumbosacral spine in a cut.

Keywords: Abdomen, Iopamidol, Large vessels, Magnetic resonance angiography, Proper scan time, Technique.

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INTRODUCTION

Standard anatomy textbooks described only the standard vascular anatomy and never touched the variant vascular anatomy. However, surgeons frequently encounter variant vascular anatomy during surgery with the easy access to the lumbosacral area anteriorly. Thus, there were clinicians’ demands to obtain the individual large abdominopelvic vascular anatomy studies preoperatively.

Angiography has been utilized clinically over many decades, and the objectives of angiography were to diagnose the diseased segment and assess easy surgical accessibility to the diseased segment. The diseases were arteriosclerosis, Buerger’s disease, and other vascular diseases. Also, angiography was practiced to assess the traumatic vessel and the trauma-induced compartment syndrome. The angiographic study of the lumbosacral area has been very limited.

Since 1990, as the numbers of the anteriorlumbar surgeries increased, there was a necessity of abdominopelvic angiographic studies for one to be well informed. The importance of the variant vascular anatomy in the lumbosacral area anatomy in relation with the lumbosacral spine is less stressed, though its necessity is essential for spine surgeons. It is, however, a well-known fact that some surgeons encounter difficulties in the anterior approach to L4–L5 and L5–S1 disks due to the varied vascular anatomy (Fig. 1). Therefore, the current authors conducted the arterial vascular study as a first step in the lumbosacral region, and mapped the aorta and its bifurcation, the iliac vessel, and lumbosacral spine simultaneously together in a cut.

Based on the arterial study results, as a second step, the current authors planned to add up the map of the large venous system to the arterial map and lumbosacral spine together in a cut (Fig. 2).

IMAGING METHODS

The best imaging time after intravenous contrast medium injection (Iopamidol, Dongkuk Pharma, Seoul, Korea) was sought after.

• For mapping of abdominal aorta, its bifurcation, common iliac arteries and their branches, a MR machine was set to scan when the contrast medium density in the blood reached a certain level, 30 seconds postcontrast medium administration.
For simultaneous mapping of vena cava, its confluence point, common iliac vein, and lumbosacral spine together after arteriography, the scan was repeated once every 10 seconds until 3 minutes.

RESULTS

- The best quality image of the lumbar aorta, its bifurcation, and common iliac arteries, and lumbosacral spine was obtained at 30 seconds postcontrast medium injection simultaneously in a cut.
- Image of the aorta, its bifurcation, vena cava, and its confluence point together with the lumbosacral spine was obtained at an average of 70 seconds after contrast medium administration in a cut.
- Best peripheral vein image was obtained when scan was done at the average 150 seconds (2.5 ± 1/6 minutes) postcontrast medium administration.

DISCUSSION

Proper MR scan time for mapping the large abdominopelvic vessels and lumbosacral spine together in a cut was long sought after by the author as a reference in anterior lumbosacral surgery. This was due to the fact that spine surgeons encountered difficulties due to variant vessel positions, including bifurcation and confluence point, in approaching the anterior surface of the lumbosacral spine for anterior arthrodesis and artificial disk replacement surgeries. To find out the most appropriate imaging time of those large abdominopelvic vessels and lumbosacral spine together, utilizing the MR technique after intravenous contrast medium (lopamidol) injection was a clinical issue.

The imaging time of those vessels and lumbosacral spine in a cut simultaneously can be influenced by the individual circulatory and excretion speed. However, in the current study, the authors assumed that the circulatory speed is constant.

Up to now, none described in detail the scan time sequences in the MR angiographies, abdominal arteriography, phlebography, and combined arteriovenography in relation with the anatomy of the lumbosacral spine in a cut.

The authors found that proper imaging time for abdominal aorta and its bifurcation point is an average 30 seconds postcontrast medium administration, and that of all the large abdominopelvic vessels, their bifurcation, and confluence points were 70 seconds postcontrast medium injection, and 150 seconds for all the peripheral veins.

It is thought that this MR imaging technique could provide the useful vascular anatomy for spine surgeons who plan to carry out successful anterior lumbosacral surgeries.

In summary, this brief article is a technical note describing the MR imaging technology: A method to visualize the large abdominopelvic vessels and lumbosacral spine together in a cut.

REFERENCES