# Preoperative Localization of Adamkiewicz Arteries and Their Origins by Using MDCT Angiography

Wiwithawan Sukeeyamanon MD\*, Thanongchai Siriapisith MD\*, Jitladda Wasinrat MD\*

\* Division of Diagnostic Radiology, Department of Radiology, Siriraj Hospital, Mahidol University, Bangkok, Thailand

**Objective:** To evaluate the ability of thoraco-abdominal MDCT angiography to visualize Adamkiewicz arteries for preoperative planning in patients diagnosed with a ortic disease.

**Material and Method:** The present study retrospectively reviewed clinical data from 73 patients who underwent a thoracoabdominal 64-slice MDCT angiography. The Adamkiewicz artery was evaluated on multiplanar reformation images in each case. The visualization of the Adamkiewicz artery, level of origin, side of origin and continuation from an intercostal artery was investigated.

**Results:** The Adamkiewicz arteries were visualized in 52 of the 73 patients (71.2%), and the total number of the delineated Adamkiewicz arteries was 64. Two Adamkiewicz arteries were found in nine patients (17.3%). Four Adamkiewicz arteries were found in one patient (1.9%). Most of the delineated arteries arose from the T9-L2 levels (89.1%). A left side of origin was found in 41 of 64 arteries (64.1%), and a right side of origin was found in 23 of 64 arteries (35.9%). Only 12 of 64 delineated arteries (18.8%) showed continuity from their origins to the anterior radiculomedullary artery.

**Conclusion:** The preoperative detection rate of the Adamkiewicz artery with the routine technique of 64-slice MDCT angiography was 71.2%. The preoperative location of the Adamkiewicz artery may help to reduce the risk of perioperative ischemic changes in the spinal cord.

Keywords: Adamkiewicz arteries, MDCT angiography, Preoperative evaluation image visualization

J Med Assoc Thai 2010; 93 (12): 1430-6 Full text. e-Journal: http://www.mat.or.th/journal

Several treatment options for thoracic aortic disease have been proposed, including medical conservative treatment, conventional open surgery, endovascular aneurysm repair (EVAR) and other minimally invasive aortic surgeries. The advantages of EVAR with transfemoral artery stent graft insertion are the lack of a need for a large open wound, the lack of a need for aortic cross clamping, minimal blood loss, lower mortality rates and fewer complications<sup>(1,2)</sup>. A major complication after EVAR is a neurodeficit secondary to spinal cord ischemia. In 2004, Leurs et al<sup>(3)</sup> studied 443 patients who underwent endovascular repair and reported that the rate of paraplegia or paresis to be 2.5%. Roselli et al<sup>(4)</sup> reported that 2.7% of patients who had been treated with a branched endovascular stent

Siriapisith T, Division of Diagnostic Radiology, Department of Radiology, Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand. Phone: 0-2419-7086 E-mail: sitsa@mahidol.ac.th graft had postoperative paraplegia. Sullivan et al<sup>(5)</sup> revealed an incidence of spinal cord ischemia after EVAR that ranged from 0 to 12.5% with an average of 2.7% in 1,895 patients.

The possible cause of spinal ischemia from EVAR is thought to be occlusion of the anterior spinal artery, which supplies the centrifugal two-thirds of the transverse area of the spinal cord. The major artery feeding the anterior spinal artery is the great anterior radiculomedullary artery, also known as the Adamkiewicz artery.

The Adamkiewicz artery is the most important arterial feeder of the lower one-third of the spinal cord. Its course is as follows: the intercostal artery arises from descending aorta and branches into an anterior and posterior branch. The posterior branch is divided into the radiculomedullary, muscular and dorsal somatic branch. The radiculomedullary artery is subdivided into the anterior and posterior radiculomedullary arteries. The anterior radiculomedullary artery accompanies the anterior nerve root and its distal

Correspondence to:

portion anastomoses with the anterior spinal artery, forming a characteristic hairpin appearance. The Adamkiewicz artery is the most dominant anterior radiculomedullary artery.

Preoperative identification of the Adamkiewicz artery is important for preventing post-EVAR spinal cord ischemia. Several studies have shown that preoperative detection of the Adamkiewicz artery and its origin results in a decrease in the incidence of post-operative complications from spinal cord ischemia<sup>(6-8)</sup>. Previous studies have revealed that the Adamkiewicz artery originates from the left intercostal artery and the lumbar artery 68-73% of the time and 62-75% from T9-T12 intercostal arteries 62-75% of the time<sup>(9)</sup>. Ability to detect the origin of the Adamkiewicz artery by using CT angiography varies with imaging techniques. The purpose of the present study was to evaluate the ability of the routine technique of CT angiography to detect the Adamkiewicz artery and its origin. The findings would serve as preoperative data for surgical planning of EVAR and as initial data for improving the technique of CT angiography for better delineation of the Adamkiewicz artery.

### Material and Method *Patients*

This retrospective study was approved by the institutional review board (certificate of approval no Si. 172/2009). The data collection was performed by searching the radiology information system for CT examinations of patients who underwent thoracoabdominal CT angiography and were diagnosed with an aortic aneurysm or dissection between January 2006 and December 2008. The patients who had been previously treated with an opened stent graft, endovascular stent graft, or thoraco-abdominal bypass graft were not enrolled in this study.

# CT acquisitions

All CT acquisitions were performed with a 64-slice MDCT scanner, Lightspeed VCT (GE Medical Systems, Milwaukee, WI, USA), with the following protocol: 64 x 1.25-mm collimation; reconstruction with 1.25-mm slice thicknesses without overlap; 1.375 pitch; 500-ms rotation time; 120 kV and 350-500 mA. Otherwise, they were performed with a Somatom Definition (Siemens Medical Systems, Forchheim, Germany) with the following scanning protocol: 64 x 1.2-mm collimation; reconstruction with 1.5-mm slice thicknesses without overlap; 1.5 pitch; 500-ms rotation time; 120 kV and 350-500 mA. Patients were

positioned feet first and supine on the couch of the CT scanner, and tomograms of the chest and whole abdomen were obtained. The non-contrast CT scan of the thoraco-abdominal aorta was performed before contrast media administration. Non-ionic iodinated contrast media was injected via an 18-20 gauge catheter at the antecubital fossa, forearm or dorsum of the hand using a 100 mL bolus of 370 mgI/mL iopromide (Bayer Schering Pharma AG, Berlin, Germany) followed by 30 mL of normal saline at 4 mL/sec with a dual syringe power injector at a maximum of 300 PSI. The bolus tracking technique was performed by using low-dose dynamic CT at the descending thoracic aorta every two seconds after a ten-second delay following contrast administration. The helical scan was obtained when the peak contrast was entering the thoraco-abdominal aorta (>150 HU).

## Image analysis

All CT angiographic data was transferred to a workstation (Advantage Workstation version 4.3, GE Medical Systems, Milwaukee, WI, USA) and displayed as a multiplanar reformation (MPR). CT images were independently reviewed by two experienced cardiovascular radiologists. A consensus was reached if the findings of the two reviewers were in disagreement. The branching level of the Adamkiewicz artery was determined on the basis of the anatomic level of the intercostal or lumbar artery that was seen branching from the Adamkiewicz artery. The anatomic level of the intercostal artery was defined as the level of the rib below which the intercostal artery ran. The intercostal or lumbar artery usually turned in a cranial direction immediately after branching from the descending aorta; we determine its branching level on the basis of the level of the vertebra from which it arose.

The criteria for visualization of the Adamkiewicz artery was made by identification of the vessel ascending to the anterior mid-sagittal surface of the spinal cord from the radiculomedullary artery, which usually arises from the dorsal branch of the intercostal or lumbar artery. The continuity of the artery was defined as continuity of aorta to intercostal or lumbar artery to radiculomedullary artery and then to the anterior radiculomedullary artery, which feeds the anterior spinal artery with a characteristic hairpin turn that connects the Adamkiewicz artery with the anterior spinal artery. The recorded information included age and sex of the patients, diagnosis of the aortic disease, visualization, side of origin and continuity of the Adamkiewicz artery.

#### Statistical analysis

The frequencies of visualization of the Adamkiewicz artery were recorded. The level of agreement between two readers was determined by using kappa values, which are measures of interobserver concordance. Values of less than 0.40 were indicative of poor concordance; values of 0.40-0.59 of moderate concordance; values of 0.60-0.79 of good concordance; and values greater than or equal to 0.80 of very good agreement.

#### Results

Seventy-three patients were included in the present study (male = 49, female = 24). The mean age was 60.7 years old (range: 13-85 years old). The Adamkiewicz artery could be demonstrated (71.2%) in 52 patients (Table 1) and the number of Adamkiewicz arteries was 64 (Table 2). All of the delineated Adamkiewicz arteries were based on a hairpin turn appearance, and 12 of the 64 vessels (18.8%) showed continuity from the origin to the anterior radiculomedullary artery. The statistical analysis of the CT findings, based on agreement between two readers, showed good concordance (kappa value: 0.76) in visualization of the Adamkiewicz artery. Both readers are concordance of images detection in 85.3%, reader 1 was more sensitive than reader 2 in 6.7% and reader 2 was more sensitive than reader 1 in 8% of patients.

Most of the patients (42 of 52; 80.8%) had one delineated Adamkiewicz artery. Nine patients had two delineated arteries (17.3%), and one patient had four delineated arteries (1.9%) (Table 1).

Levels of origin of the Adamkiewicz artery ranged from the T7 to the L3 level. The most common level of origin was the T12 level (13 of 64; 20.3%). Most of the delineated arteries arose from the T9-L2 levels (57 of 64; 89.1%) (Table 2).

Regarding side of origin from the descending aorta, 41 of 64 vessels (64.1%) originated from the left side of the aorta and 23 of 64 vessels (35.9%) originated from the right side of the aorta (Table 2).

Of all 73 patients, 25 patients had a diagnosis of aortic dissection and 24 patients had diagnosis of aortic aneurysm. One patient had a diagnosis of aortic ulcer with an intramural thrombus.

#### Discussion

There are several studies revealing the usefulness of preoperative detection the Adamkiewicz artery for reducing postoperative paraplegia or paraparesis that is a serious complication<sup>(6-8)</sup>.

According to previous literature, the ability to detect the Adamkiewicz artery ranges from 18% to 100%<sup>(2,9-16)</sup>. Takase et al<sup>(17)</sup> reported that the Adamkiewicz artery could be detected at 90% with CT angiography in 70 patients with an average age of 68.4 years. In the present study, the continuity between the posterior branch of the intercostal artery or lumbar artery and the Adamkiewicz artery was 31.7%. Kunishiro et al<sup>(9)</sup> reported an 83% detection rate of the Adamkiewicz artery in 30 patients with 60% of continuity along its course able to be followed with CT angiography with a 16-slice MDCT. Boll et al<sup>(14)</sup> reported 100% delineation of the Adamkiewicz artery with CT angiography with a 40-slice MDCT in 100 patients with ages ranging from 34 to 89 years (mean 60.5 years). In these patients, 46% of the continuity of the Adamkiewicz along its course was appreciable with CT angiography.

The purpose of the present study was to evaluate the ability of CT angiography to detect the Adamkiewicz artery and its origin for the purpose of providing preoperative data for surgical planning of EVAR. In this study, the visualization of the Adamkiewicz artery from CT angiography of the thoraco-abdominal aorta was possible in 52 of 73 patients (71.2%) and the number of delineated

**Table 1.** Number of the Adamkiewicz artery in each patient(n = 52)

Number of Adamkiewicz artery	Number of patients (%)	
Single	42 (80.8)	
Two	9 (17.3)	
Four	1 (1.9)	

Table 2. Level and side of origin of the Adamkiewicz artery

	Left	Right	Total (%)
Т7	2	1	3 (4.7)
Т8	1	2	3 (4.7)
Т9	5	1	6 (9.4)
T10	5	2	7 (10.9)
T11	6	6	12 (18.8)
T12	8	5	13 (20.3)
L1	9	2	11 (17.2)
L2	4	4	8 (12.5)
L3	1	-	1 (1.6)
Total	41	23	64



Fig. 1 Identification and continuation of Adamkiewicz artery. A 64-year-old woman presented with acute chest pain and acute intramural hematoma on the thoraco-abdominal CT angiography. Coronal MPR (a) and curved planar reformation images (b) showed a hairpin appearance (arrow) of Adamkiewicz artery arising from left T10 level. The radiculomedullary artery (double arrowheads) communicating between intercostal artery (arrowhead) and Adamkiewicz artery was demonstrated.Noted the descending aorta (Ao) was the origin of the intercostal artery

Adamkiewicz arteries was 64 vessels. All of them were delineated based on a characteristic hairpin turn appearance. Only 12 of 64 delineated vessels (18.8%) showed continuity from their origins to the anterior spinal artery (Fig. 1).

No significant differences were detected between the CT angiography technique used in the present study and those used in prior studies<sup>(9,14,17)</sup>. There were, however, some differences in the imaging analysis methods. The volume-rendering imaging and curved planar reformation were used in all studies. On the other hand, the techniques that may increase the detection rate of the Adamkiewicz artery above the rate observed in previous studies including maximum intensity projection (MIP)<sup>(9,10,13,17)</sup>, a brain reconstruction algorithm with a filtering procedure that eliminates beam hardening artifacts from high density osseous formations<sup>(14)</sup> and a cine-mode display<sup>(13,17,18)</sup>. As the result of the present study, only 12 of 64 delineated vessels (18.8%) showed continuity from their origins to the anterior spinal artery. The possible cause of a lower detection rate in the continuity from the intercostal artery to the Adamkiewicz artery than the other studies<sup>(9,10,13,14,17)</sup> is imaging analysis techniques. The authors did not

use the curved planar reformation that could bring better delineation of the vessel course. In the other studies, all of them use curved reformation to help in detection of this continuity and all of them used three dimensional display (volume rendering) images. The MPR was simply to use, whereas curved planar reformation needs special practice to perform and might not be practical in routine use, particularly in emergencies.

Age of the patients may be another factor affecting the detection rate and the ability to follow the entire course of the Adamkiewicz artery by CT angiography. Ou et  $al^{(13)}$  reported a 95% detection rate and 100% continuity along the course of the Adamkiewicz artery with CT angiography in 40 patients with an age range of 5-14 years and a mean age of 7.5 years. These high rates could be due to the decreased number of osseous artifacts from degenerative change processes such as osteophytes of the spine or atherosclerosis in people of this age.

In the present study, the Adamkiewicz arteries originated from the T7 to the L3 level. Most of them (89.1%) originated from the T9 to the L2 level. From the recent literature, the highest level in origin of the Adamkiewicz artery is at the T5 intercostal artery<sup>(13,17)</sup>, the lowest level is at the L3 lumbar artery<sup>(19)</sup> and there are minimal differences in range of their origins to prior studies such as T8-L1 (92%) in the study of Takase et al<sup>(17)</sup>, T9-T12 (89%) in the study of Boll et al<sup>(14)</sup> and T8-T11(93%) in the study of Yoshioka et al<sup>(10)</sup>.

About two-thirds of the Adamkiewicz arteries in the present study (64.1%) originated from the left side of the intercostal or lumbar arteries. These are similar to the findings in most of the previous studies that showed a predominate left sided in origin of the Adamkiewicz artery in 63-72% of cases (72.4%),  $63\%^{(14)}$ ,  $71\%^{(13)}$ ,  $71\%^{(17)}$ ,  $63\%^{(19)}$ ,  $69\%^{(15)}$ ,  $72.2\%^{(11)}$ ). Koshino et al<sup>(20)</sup> showed 70% of the cadavers had a left sided origin of the Adamkiewicz artery.

Most of the patients (80.8%) had one Adamkiewicz artery and the authors found two Adamkiewicz arteries in nine patients (17.3%). Takase et al<sup>(17)</sup> reported that about 24% of the patients had duplication of the Adamkiewicz artery by intra-venous CT angiography. Boll et al<sup>(14)</sup> reported duplication of the Adamkiewicz artery in 5% of the patients in their study. Kawaharada et al<sup>(7)</sup> reported that duplication of the Adamkiewicz artery was found in about 11% of patients with magnetic resonance angiography (MR angiography). Nojiri et al<sup>(19)</sup> studied intra-arterial



Fig. 2 Visualization of four Adamkiewicz arteries. A 70-year-old man presented with aortic aneurysm underwent thoraco-abdominal CT angiography. Coronal MPR showed hairpin appearance (arrow) of four Adamkiewicz arteries at right T7 (a), right T12 (b), left L1 (c) and left L2 (d) levels

CT angiography to depict the Adamkiewicz artery and reported that 37% of the patients had duplication of the Adamkiewicz artery and 3.7% of the patients had three Adamkiewicz arteries. In the present study, a patient showed four Adamkiewicz arteries (Fig. 2).

There are other imaging techniques to improve preoperative detection of the Adamkiewicz artery, such as intra-arterial CT angiography or MR angiography. Uotani et al<sup>(2)</sup> also did a comparison of preoperative detection of the Adamkiewicz artery between IACTA and conventional CT angiography with intravenous CT angiography (IVCTA) in 32 patients by using 16-slice MDCT with 100 mL of contrast material (370 mg/mL) injected at rate of 5 mL/s. Contrast was injected via the antecubital veins of 15 patients and via a pig-tail catheter placed at the proximal portion of the descending aorta in 17 patients who underwent IVCTA and IACTA, respectively. The results of that study showed that IACTA was significantly more sensitive in identifying of the Adamkiewicz artery than IVCTA: 94.1% versus 60.0%. In addition, continuity between the Adamkiewicz artery and the aorta through the intercostals or lumbar artery was confirmed in 87.5% by IACTA and 55.6% by IVCTA.

Nojiri et al<sup>(19)</sup> reported preoperative demonstration of the Adamkiewicz artery by IACTA in 27 patients, mean age 62.4 years who underwent preoperative conventional digital subtraction angiography (DSA). A 4 Fr pigtail catheter was placed at the descending aorta. Then DSA was performed (16 mL contrast medium was injected at 8 mL/s in aneurysm cases and 20 mL of contrast medium was injected at 10 mL/s in the dissection cases). The IACTA was performed by 4-slice MDCT and 6-slice MDCT. About 100 mL of Iomeprol 400 mg I/mL, 370 mg I/mL of Iopamidol or 300 mg I/mL of Iohexol contrast medium was injected at 4-5 mL/s in aneurysm cases. For the dissection cases, a total of about 120 mL was injected at 7 mL/s. The CT scan was started at 4.5-7 seconds after the start of injection from the level of upper T7 to the lower end of L3. The results showed that the Adamkiewicz arteries were clearly visualized with at least one artery being seen in all patients.

With the high preoperative detection rate of the Adamkiewicz artery in patients with aortic aneurysm and aortic dissection by IACTA, it should be considered a good method for demonstrating this important vessel. However, it is a more invasive method than the IVCTA and may increase complications from the procedure. Furthermore, for the patients who were diagnosed with aortic dissection, Apostolakis et al<sup>(21)</sup> suggested that the discomfort and pain from the procedure might increase the vessel's pressure and the potential risk of rupture. On the other hand, if the catheter tip was inserted into the false lumen, this could cause an incomplete demonstration of the origin or course of the Adamkiewicz artery.

Ability to detect the Adamkiewicz artery by MR angiography was 66.7% to 100%<sup>(6-8,22)</sup>. Hideki et al<sup>(6)</sup> reported an ability to detect the Adamkiewicz artery by MR angiography (1.5 Tesla) with dynamic three-dimension fast spoiled gradient-recalled acquisition in the steady state with a bolus contrast material of 84%. Nijenhuis et al<sup>(22)</sup> did a comparison between MR angiography (1.5 Tesla) and DSA in 15 patients with suspected spinal cord vascular pathology and reported that localization and spatial configuration of the Adamkiewicz artery by contrast enhanced-MR angiography (CE-MRA) was in agreement with DSA findings in 14 of 15 cases. One mismatch of one vertebral level (not side) appeared as a result of the tangled vascular pathology. Image quality of DSA is superior to CE-MRA concerning vessel continuity, sharpness, and background homogeneity. A total volume of 45 mL (0.3 mmol/kg

of body weight) of contrast agent was used. Several phases in dynamic MR studies, which provide superior temporal resolution, will be useful in identifying the Adamkiewicz artery.

A limitation of the present study is the lack of spinal angiography, which remains the gold standard for confirming the results. With the configuration of the Adamkiewicz artery that appears to be the classical hairpin turn, it is difficult to distinguish it from the anterior radiculomedullary vein, which is similar in shape to the Adamkiewicz artery and may follow a course very close to the Adamkiewicz artery. Even though a minimal wider angle, which is called a "coat hook" shape, is noted at the angle of the radiculomedullary vein and the Adamkiewicz artery<sup>(9)</sup>, it is still difficult to identify these two vessels. Visualization of continuity along the Adamkiewicz artery is helpful for confirming this identification.

#### Conclusion

The routine technique of CT angiography performed with 64-slice MDCT was able to visualize the Adamkiewicz artery in 71.2% of patients in the present study. Radiologists should be concerned with determining the origin of the Adamkiewicz artery because this could prevent the serious complication of spinal ischemia in patients with preoperative evaluations of EVAR.

### References

- 1. Park S, Min PK, Joung B, Ko YG, Choi D, Jang Y, et al. Comparison of a percutaneous separate stent endograft and a conventional thoracic stent-graft for endovascular repair of type B aortic dissection. J Endovasc Ther 2004; 11: 378-84.
- Uotani K, Yamada N, Kono AK, Taniguchi T, Sugimoto K, Fujii M, et al. Preoperative visualization of the artery of Adamkiewicz by intra-arterial CT angiography. AJNR Am J Neuroradiol 2008; 29:314-8.
- Leurs LJ, Bell R, Degrieck Y, Thomas S, Hobo R, Lundbom J. Endovascular treatment of thoracic aortic diseases: combined experience from the EUROSTAR and United Kingdom Thoracic Endograft registries. J Vasc Surg 2004; 40: 670-9.
- 4. Roselli EE, Greenberg RK, Pfaff K, Francis C, Svensson LG, Lytle BW. Endovascular treatment of thoracoabdominal aortic aneurysms. J Thorac Cardiovasc Surg 2007; 133: 1474-82.
- 5. Sullivan TM, Sundt TM III. Complications of thoracic aortic endografts: spinal cord ischemia

and stroke. J Vasc Surg 2006; 43(SupplA): 85A-8A.

- Hyodoh H, Kawaharada N, Akiba H, Tamakawa M, Hyodoh K, Fukada J, et al. Usefulness of preoperative detection of artery of Adamkiewicz with dynamic contrast-enhanced MR angiography. Radiology 2005; 236: 1004-9.
- Kawaharada N, Morishita K, Hyodoh H, Fujisawa Y, Fukada J, Hachiro Y, et al. Magnetic resonance angiographic localization of the artery of Adamkiewicz for spinal cord blood supply. Ann Thorac Surg 2004; 78: 846-51.
- Yamada N, Okita Y, Minatoya K, Tagusari O, Ando M, Takamiya M, et al. Preoperative demonstration of the Adamkiewicz artery by magnetic resonance angiography in patients with descending or thoracoabdominal aortic aneurysms. Eur J Cardiothorac Surg 2000; 18: 104-11.
- 9. Yoshioka K, Niinuma H, Ehara S, Nakajima T, Nakamura M, Kawazoe K. MR angiography and CT angiography of the artery of Adamkiewicz: state of the art. Radiographics 2006; 26(Suppl 1): S63-73.
- Yoshioka K, Niinuma H, Ohira A, Nasu K, Kawakami T, Sasaki M, et al. MR angiography and CT angiography of the artery of Adamkiewicz: noninvasive preoperative assessment of thoracoabdominal aortic aneurysm. Radiographics 2003; 23: 1215-25.
- Zhao SH, Logan L, Schraedley P, Rubin GD. Assessment of the anterior spinal artery and the artery of Adamkiewicz using multi-detector CT angiography. Chin Med J (Engl ) 2009; 122: 145-9.
- von Tengg-Kobligk H, Bockler D, Jose TM, Ganten M, Kotelis D, Nagel S, et al. Feeding arteries of the spinal cord at CT angiography before and after thoracic aortic endografting. J Endovasc Ther 2007; 14: 639-49.
- Ou P, Schmit P, Layouss W, Sidi D, Bonnet D, Brunelle F. CT angiography of the artery of Adamkiewicz with 64-section technology: first experience in children. AJNR Am J Neuroradiol 2007; 28: 216-9.
- Boll DT, Bulow H, Blackham KA, Aschoff AJ, Schmitz BL. MDCT angiography of the spinal vasculature and the artery of Adamkiewicz. AJR Am J Roentgenol 2006; 187: 1054-60.
- 15. Kudo K, Terae S, Asano T, Oka M, Kaneko K, Ushikoshi S, et al. Anterior spinal artery and artery of Adamkiewicz detected by using multi-detector row CT. AJNR Am J Neuroradiol 2003; 24: 13-7.
- 16. Takase K, Akasaka J, Sawamura Y, Ota H, Sato A,

Yamada T, et al. Preoperative MDCT evaluation of the artery of Adamkiewicz and its origin. J Comput Assist Tomogr 2006; 30: 716-22.

- 17. Takase K, Sawamura Y, Igarashi K, Chiba Y, Haga K, Saito H, et al. Demonstration of the artery of Adamkiewicz at multi- detector row helical CT. Radiology 2002; 223: 39-45.
- 18. Yoshioka K, Niinuma H, Ohira A, Kawakami T, Kawazoe K. Three-dimensional demonstration of the artery of Adamkiewicz by multidetector-row computed tomography. Ann Thorac Surg 2004; 78:719.
- 19. Nojiri J, Matsumoto K, Kato A, Miho T, Furukawa K, Ohtsubo S, et al. The Adamkiewicz artery: demonstration by intra-arterial computed

tomographic angiography. Eur J Cardiothorac Surg 2007; 31: 249-55.

- 20. Koshino T, Murakami G, Morishita K, Mawatari T, Abe T. Does the Adamkiewicz artery originate from the larger segmental arteries? J Thorac Cardiovasc Surg 1999; 117: 898-905.
- 21. Apostolakis E, Akinosoglou K. Is preoperative demonstration of Adamkiewicz's artery a clinical reality in acute aortic dissection? Eur J Cardiothorac Surg 2007; 32: 684-5.
- 22. Nijenhuis RJ, Mull M, Wilmink JT, Thron AK, Backes WH. MR angiography of the great anterior radiculomedullary artery (Adamkiewicz artery) validated by digital subtraction angiography. AJNR Am J Neuroradiol 2006; 27: 1565-72.

# ความสามารถในการระบุจุดกำเนิดของหลอดเลือดแดง Adamkiewicz โดยการตรวจด้วยเอกซเรย์ คอมพิวเตอร์ MDCT angiography

# ้วิวิธวรรณ สุคียามานนท์, ทนงชัย สิริอภิสิทธิ์, จิตรลัดดา วะศินรัตน์

**วัตถุประสงค์**: เพื่อศึกษาความสามารถในการตรวจพบหลอดเลือดแดง Adamkiewicz ของการตรวจเอกซเรย์ คอมพิวเตอร์ของหลอดเลือดแดง ส่วนซ่องอกและท้อง เพื่อนำมาใช้ในการวางแผนสำหรับการผ่าตัด **วัสดุและวิธีการ**: ทำการศึกษาย้อนหลังในภาพเอกซเรย์หลอดเลือดแดงส่วนอกและส่วนท้องของผู้ป่วย 73 ราย ที่ได้รับการตรวจด้วย MDCT angiography ชนิด 64 หัวตรวจ เพื่อตรวจหาหลอดเลือดแดง Adamkiewicz ใน ภาพ multiplanar reformation โดยศึกษาระดับของจุดกำเนิดหลอดเลือดตำแหน่งของจุดกำเนิดหลอดเลือด และ ความต<sup>่</sup>อเนื่องกับหลอดเลือด intercostal

**ผลการศึกษา**: สามารถตรวจพบหลอดเลือดแดง Adamkiewicz ได้ในผู้ป<sup>่</sup>วย 52 รายจาก 73 ราย (71.2%) ซึ่งมี ้จำนวนทั้งหมด 64 หลอดเลือด พบผู้ป่วย 9 ราย (17.3%) ที่มีหลอดเลือดแดง Adamkiewicz จำนวน 2 หลอดเลือด พบผู้ป่วย 1 ราย (1.9%) ที่มีหลอดเลือดแดง Adamkiewicz จำนวน 4 หลอดเลือด และโดยส่วนใหญ่พบจุดกำเนิด เริ่มที่ตำแหน่งหลอดเลือดระดับ T9 ถึง L2 (89.1%) พบจุดกำเนิดหลอดเลือดออกจากทางด้านซ้ายจำนวน 41 หลอดเลือด จาก 64 หลอดเลือดแดง (64.1%) และออกจากด้านขวาจำนวน 23 หลอดเลือด (35.9%) พบหลอดเลือด

ที่มีความต่อเนื่องกับจุดกำเนิดจากหลอดเลือดแดง anterior radiculomedullary เพียง 12 หลอดเลือด (18.8%) **สรุป**: ภาพเอกซเรย์หลอดเลือดแดงจากการตรวจด้วย MDCT angiography ซนิด 64 หัวตรวจในผู้ป่วยก่อนรับการ ้ผ<sup>่</sup>าตัด มีอัตราการตรวจพบหลอดเลือดแดง Adamkiewicz เป็น 71.2% การตรวจพบหลอดเลือดแดง Adamkiewicz ก่อนทำการผ่าตัดอาจจะช่วยในการลดอัตราการเกิดไขสันหลังขาดเลือดในระหว่างการผ่าตัดได้