Sağ koroner arter çıkış anomalilerinde yeniden şekillendirilen sol Judkins kateter ile sağ koroner anjiyografisi: Bir sol Judkins ile iki kuş

Right coronary angiography performed using reshaped left Judkins catheter in cases with anomalous origins of right coronary artery: killing two birds with one left Judkins catheter

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ÖZET

Amaç: Sağ koroner arterin (RCA) çıkış anomalilerinde anjiyografi esnasında selektif olarak kanülasyon güçleşmektedir. Bu çalışmada, RCA'nın anjiyografik olarak selektif kanülasyonunun zor olduğu olgularda el ile yeniden şekillendirilen sol Judkins kateter ile kanülasyonun başarı oranı incelendi.

Çalışma planı: Çalışmaya 1 Kasım-31 Aralık 2011 tarihleri arasında kararlı anjina pektoris veya akut koroner sendrom tanıları ile hastanemize başvuran ardışık 837 (456 erkek, 381 kadın) hasta alındı. RCA kanülasyonunun yapılamadığı olgularda sol Judkins 4 kateterinin sekonder eğiminin proksimalindeki 10 cm'lik bölüme içe doğru eğim verildi. Ardından kateterin ikincil eğim açısı yaklaşık olarak 100 dereceye kadar, birincil eğim açısı da 120 dereceye kadar artırılarak selektif RCA kanülasyonu denendi.

Bulgular: Çalışmaya alınan 837 hastanın 49'unda sağ Judkins 4 kateteri ile RCA kanüle edilemedi. Bu hastaların 42'sinde (%86) el ile yeniden şekillendirilen sol Judkins kateter ile selektif kanülasyon yapılabildi. Aşağı doğru açılı sağ koronerlerin 4'ünde, yukarı doğru açılı 1, yüksek çıkışlı 1 ve anteriyor çıkışlı 1 olguda yeniden şekillendirilen Judkins kateteri ile de RCA kanüle edilemedi. Bu olgular için sırasıyla, çok amaçlı kateter, internal mamaryan arter kateteri, sol Amplatz 1 ve sağ Amplatz 1 kateterleri kullanıldı. Kanülasyon esnasında göğüs ağrısı, elektrokardiyografik değişiklik ya da hemodinamik bozulma izlenmedi.

Sonuç: RCA'nın selektif olarak kanülasyonunun zor olduğu durumlarda yeniden şekillendirilen sol Judkins kateter ile selektif kanülasyon başarılı ve maliyet etkin bir yöntem olabilir.

ABSTRACT

Objectives: Selective cannulation of the right coronary ar-tery (RCA) in the anomalous aortic origin of the RCA is tech-nically difficult and challenging. İn this study, we tested the success of RCA cannulation with a reshaped left Judkins catheter in cases of difficult selective cannulation.

Study design: The study population consisted of 837 con-secutive patients (456 male, 381 female) that were admitted to our hospital with stable angina pectoris and acute coronary syndrome betvveen October 1 and December 31, 2011. İn cases where RCA cannulation was difficult, the 10 centimeter section of the left Judkins proximal to the secondary curve was reshaped by hand to form an inward slope. The secondary curve angle was increased to approximately 100 degrees and the primary curve angle was adjusted to 120 degrees. Then, we attempted to perform selective RCA cannulation. **Results:** İn 49 of the 837 patients, selective RCA cannulation was unsuccessful with the right Judkins catheter. İn 42 of these 49 (86%) cases, the RCA was cannulated with the reshaped left Judkins. We failed to cannulate the right coronary in two cases with downward angulation, one with up-ward angulation, one with high take-off origin, and one with anterior origin. A multipurpose, internal mammary artery, left Amplatz 1, and right Amplatz 1 catheter were used for cannulation in these cases, respectively There was no angina, nor were there electrocardiographic or hemodynamic changes during the procedure.

Conclusion: In cases where the selective cannulation of the RCA is difficult, using a reshaped left Judkins may be a successful and cost-effective method of selective cannulation.

Right coronary artery stems from the right coronary sinus, descends between pulmonary root, and right atrium, and reaches to the base of the heart. Then it makes a posterior turn, and proceeds in the atrioventricular forrow. Anomalous aortic origin of RCA or upward or downward angulations of the proximal segment of ascending RCA complicates selective cannulation during coronary angiography.[1] This condition might prolong procedures performed during effective coronary angiography, increase amount of radioopaque material used, and radiation dose exposed. Besides in cases requiring primary percutaneous interventions, it might increase total duration of ischemia. During clinical applications, various diagnostic catheters have been used in cases with anomalous origin of RCA.[2]

In this study, a practical, and cost-effective method was presented which had been developed to facilitate cannulation in cases with anomalous origins or RCA or in those not classified as an anomaly but demonstrate downward or upward angulations which complicate selective cannulation.

PATIENTS AND THE MATERIAL

Our study included 837 successive patients who had undergone coronary angiographic examinations in our hospital between November 1, and December 31, 2011. Coronary angiography was performed by experienced surgeons who had individually performed at least 1000 coronary angiographies per year. For coronary angiographic examinations, 6F arterial sheath was inserted through common femoral artery using selective Judkins method under local anesthesia. For RCA angiography, right Judkins 4 catheter was used. In cases where RCA cannot be negotiated using 6F right Judkıns 4 catheter, and absence of retrograde filling of RCA, then coronary anomaly was suspected, and left Judkins 4 catheter was reshaped manually. Ten centimeter-segment of the left Judkins 4 catheter proximal to the secondary curve was reshaped manually to form an inward slope. Then secondary curve angle was increased to approximately 100 degrees, and primary curve angle was adjusted to 120 degrees. (Figure 1, 2, 3). Then reshaped left Judkins catheter was advanced into aortic sinus.
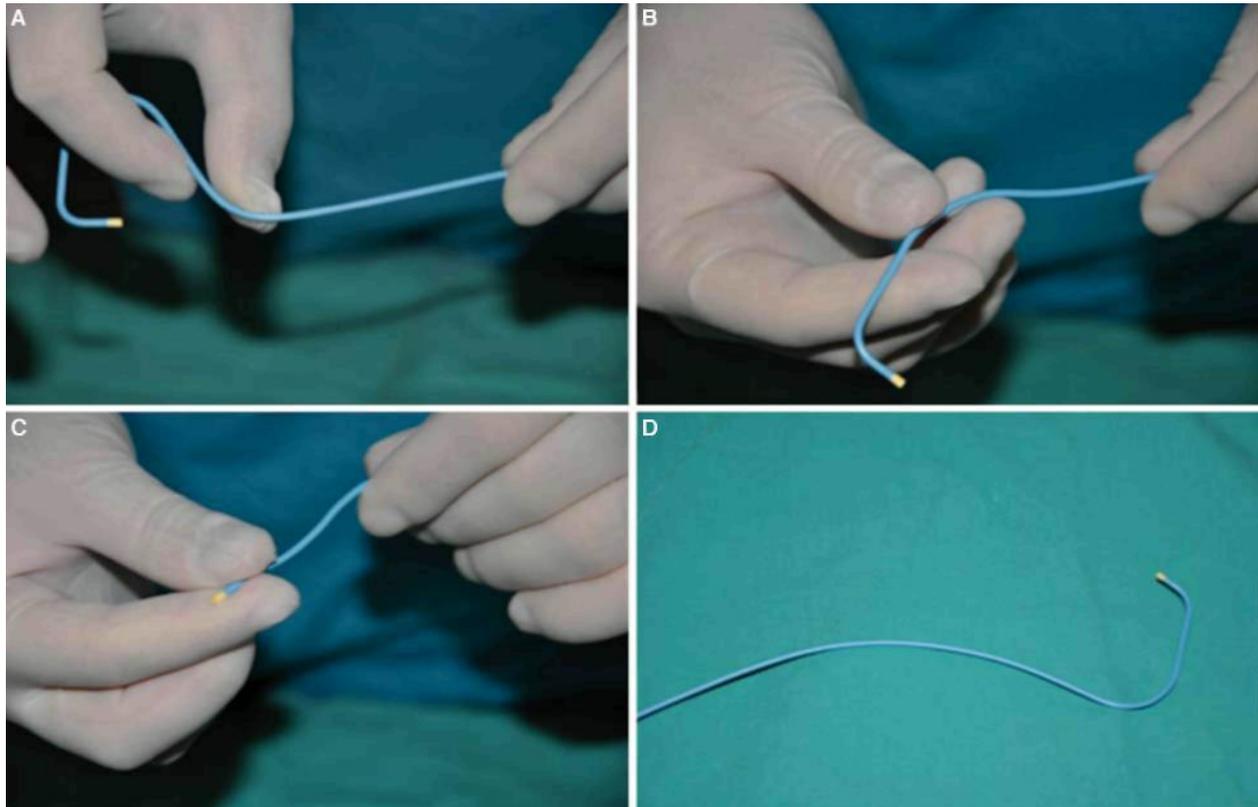

Figure 1. **(A)** 10 centimeter section of the left Judkins 4 catheter proximal to the secondary curve was reshaped to form an inward slope. (B) The angle of the secondary curve was increased up to nearly 100 degrees (C) The angle of the primary curve was increased to 120 degrees (D) The final shape of the catheter.
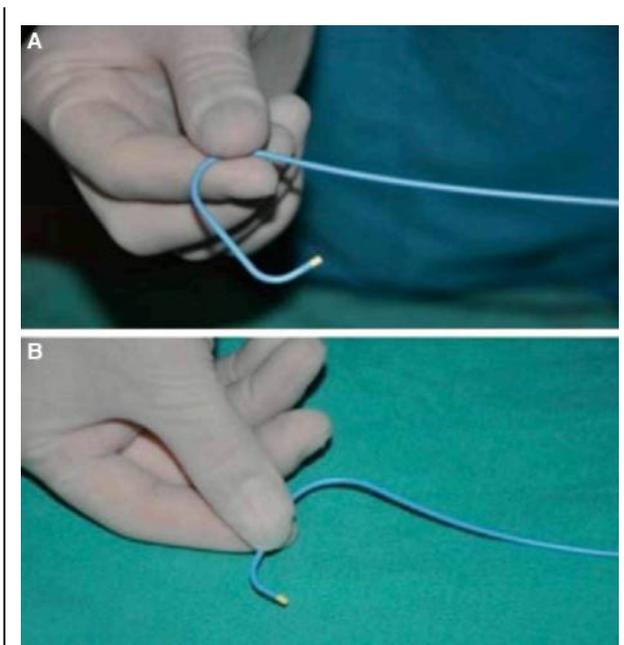
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Figure 2. (A) Original left Judkins catheter **(B)** reshaped left Judkins catheter
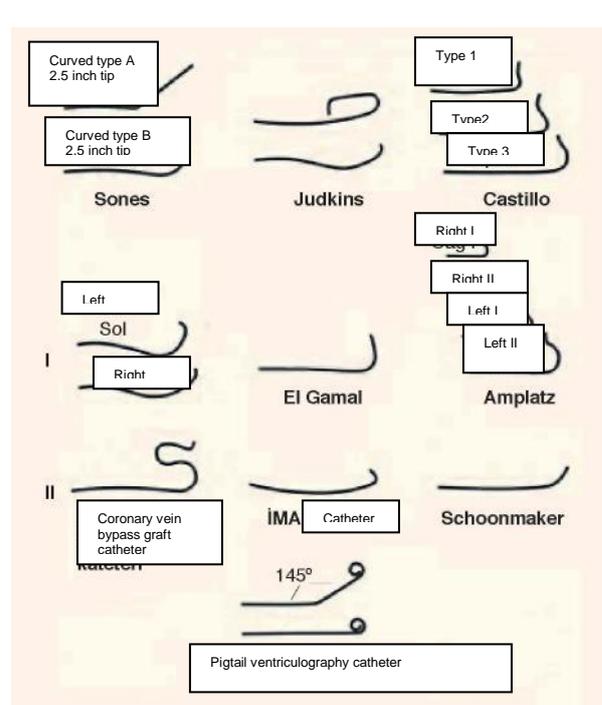

Figure 3. Catheters frequently used for coronary angiography.

Coronary ostium was localized with nonselective injections into RCA originating from the left aortic sinus, and with small manipulative manoeuvres attempts were made to negotiate into RCA. For anomalous RCAs originating from the right aortic sinus, approximate aortic origin was estimated with semiselective or nonselective injections of contrast material into aortic root, then catheter was withdrawn a little, and rotated counterclockwise. When on angiograms straightening of the secondary curve of the catheter began to be visualised, for cannulation of RCA, catheter was advanced a little downward to insert it into aortic sinus. For the cannulation of anomalous origins of RCA, JR 3.5, and 5F JR catheters were not used.

During the procedure, electrocardiographic, hemodynamic, and pulse oxymetric monitorizations were performed.

Angiographic definitions

A complete consensus does not exist for the definition of anomalous origins of coronary arteries Therefore, in our study, we classified anomalies, and variatians which complicate selective cannulation of coronary artery as follows:

(1) RCA originating from the left aortic sinus, (2) RCA with high take-off origin, (3) RCA originating from anterior or superior surface of the aortic sinus, (4) RCA with excessive downward or upward angulation Normally proximal segment of coronary artery originates at right angles from aorta.

Some publications report that this angle should be between 45, and 90 degrees.[1] Occasionally, proximal segment of the coronary artery can demonstrate prominently curved take-offs.

RESULTS

Selective cannulation could not be performed using right Judkins catheter in 49 out of 837 patients who had undergone coronary angiographic examinations. In 3 cases, RCAs originated from the left aortic sinus and immediately anterior to the left common coronary artery orifice. They also stemmed from above sinotubular junction (n=2), and anterior to the right anterior sinus (n=17). In 27 cases proximal segment of RCA had demonstrated downward (n=14), and upward (n=13) angulations. (Table 1).

Tablo 1. Frequency of anomalous origins, and variation of RCA in patients in whom standard cannulations could not be performed.

Anomaly/variation	(n=837)	(%)
Anomalous origin from the left aortic sinus	3	0.3
High take-off origin	2	0.2
Anomalous origin from anterior to the right aortic sinus	17	2
	27	3.2

RCA: Right coronary artery

After selective angiograms of the left coronary artery were obtained, and failed selective cannulation of RCA, using right Judkins 4 catheter, in 86 % of the patients (n=42) RCA cannulation was then achieved with manuallly reshaped left Judkins 4 catheter (Figure 4). Four RCA cases with downward angulation, and cases of RCA with upward angulation (n=1), high (n=1), and anterior (n=1) take-off could not be selectively cannulated using left Judkins 4 catheter.
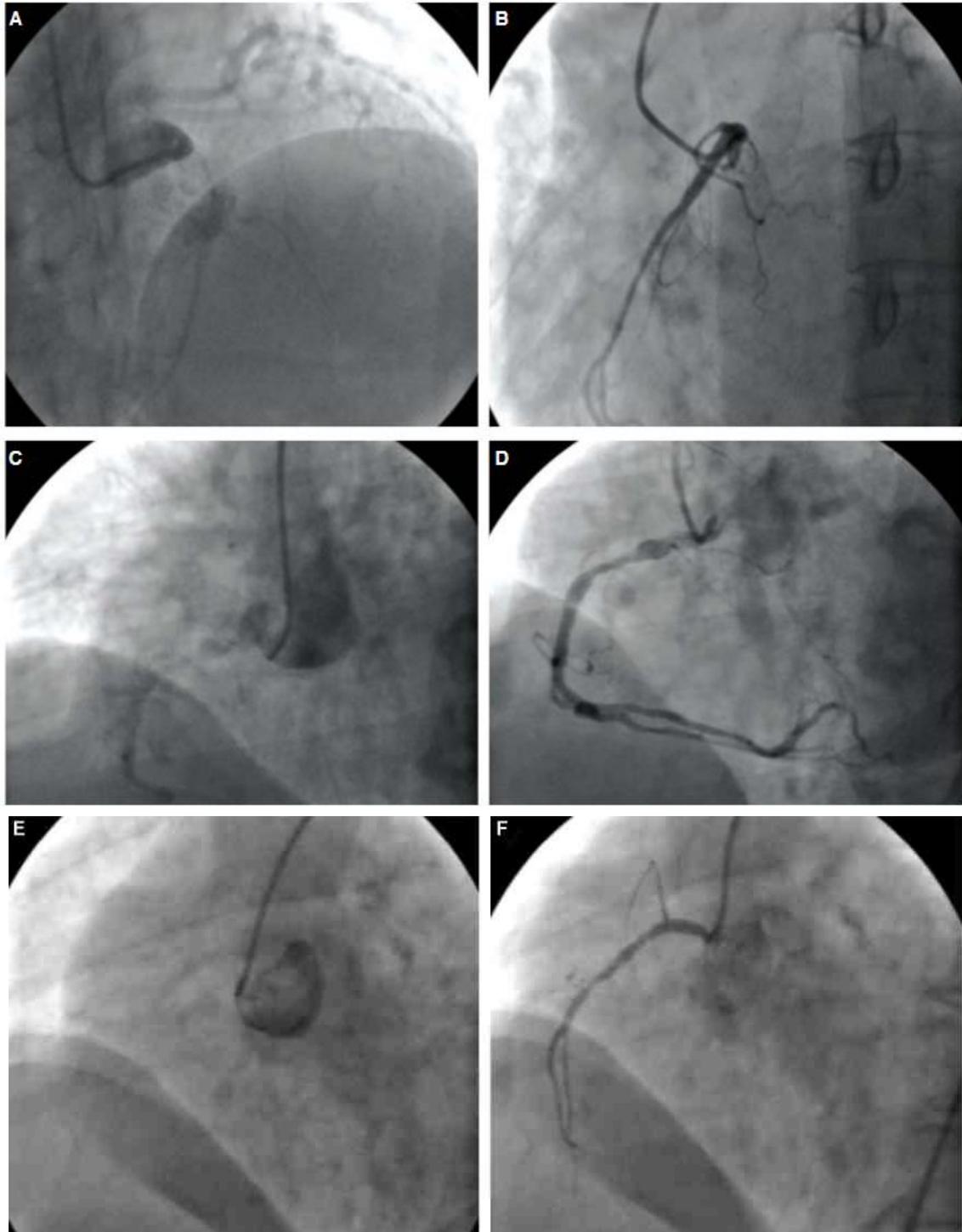

Figure 4. (A) Non-selective images of the right coronary artery originating from left coronary sinus obtained cannulation with an Amplatz 1 catheter, (B) selective imaging using manually reshaped left Judkins catheter; (C) non-selective injection through a right Amplatz catheter into RCA with an anterior take-off, (D) selective cannulation using a reshaped left Judkins catheter; (E) non-selective injection through right Amplatz catheter into RCA with an anterior take-off, (F) selective cannulation using a reshaped left Judkins catheter. RCA: Right coronary artery

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Selective cannulation was performed using multipurpose catheter in 4 cases with right coronary arteries with downward angulations, and IMA catheter was used for cases with upward angulations. However selective cannulation was applied for high take-off RCA using left Amplatz 1 catheter, and for the selective cannulation of a case with an anterorly situated anomalous origin of RCA right Amplatz 1 catheter was used. Besides, catheter selective cannulation with right Judkins 4 could be achieved in 9 cases with anomalous origin of RCA. In none of the patients chest pain, electrocardiographic changes, and hemodynamic deterioration were observed.

DISCUSSION

Using manually reshaped left Judkins catheter, relatively higher success rates have been reported for cannulations applied for RCA take-off anomalies, and their numerous variations which complicate access into RCA

Reports indicate the incidence of anomalous origins of coronary arteries as varying between 0.3, and 5.64 percent.[4] In comparison, anomalous origins of RCA are rarely seen. Besides, upward, and downward angulations of proximal segments of coronary arteries which are not defined as anomalous origins of coronary arteries complicate application of selective cannulation. These anomalies, and variations can prolong procedural times, time to percutaneous intervention in cases of emergency, and duration of total ischemia.[2]

Though some case reports have indicated application of different types of catheters[1] in cases with challenging selective cannulation of RCA, studies investigating average number of catheters used for these cannulations have not been conducted so far. In daily angiographic applications, it is a known fact that varying types of catheters are being used to overcome problems experienced during access into RCA. This challenging condition causes marked increases in the periprocedural cost, and naturally it can prolong fluoroscopy time, and enhance amount of radiation dose exposed.

Besides need for CT coronary angiography in unsuccessful cases of selective cannulation increases periprocedural cost. Our more cost-effective approach presented herein will enable application of selective right coronary angiography with a higher rates of success.

In conclusion, anomalous origins of RCA, and their variations are encountered relatively frequently during daily angiographic applications, and selective cannulations of coronary arteries might pose difficulties. This simple method we described can achieve RCA cannulation with higher success rates, and lower cost-effectiveness.

Limitations of the study

In our study, duration of the scopy, and amount of radiation exposure were not estimated. Due to lack of quantitative data evaluating unsuccessful cannulations, decision about failed cannulation using standard right Judkins 4 catheter was based on experience.

Conflict of interest: none declared.

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Anahtar sözcükler: Koroner anjiyografi; koroner damar anomalisi.

Key words: Coronary angiography; coronary vessel anomalies.