Vertebral artery, the sonography does exist.

Poster No.: C-2165
Congress: ECR 2012
Type: Scientific Exhibit
Authors: A. Puerta Sales, L. A. Sanchez Alonso, L. Aleman Romero, V. Garcia-Medina, D. Rodríguez Sánchez, F. Velázquez Marín; Murcia/ES
Keywords: Arteries / Aorta, Head and neck, Ultrasound, Ultrasound-Spectral Doppler, Ultrasound-Colour Doppler, Diagnostic procedure, Comparative studies, Arteriosclerosis
DOI: 10.1594/ecr2012/C-2165

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Purpose

Since the pathology of the vertebral arteries is not usually treated, as would the carotid artery, its ultrasound (US) exam is not considered practical and not exhaustively performed.

The relationship between vertebral artery pathology and the neurological signs and symptoms is much less defined compared to the carotid circulation.

That's why the vast majority of the patients being made a Doppler analysis of the supra-aortic trunks are not properly studied in order to detect vertebral artery abnormalities.

The purpose of these presentation is:

- To know the differences between the collected Doppler parameters.

- Analyze the diagnostic-therapeutic algorithm in a sonographically subclavian steal proven patient with no previous clinical suspicion.

- Conocer las diferencias que existen entre los distintos parámetros recogidos.

- Analizar el algoritmo diagnóstico-terapéutico de un paciente que se diagnostica de robo de la subclavia mediante ecografía, con especial énfasis en aquellos con síndrome del robo de la subclavia en los cuales no exista sospecha clínica previa.
Methods and Materials

We conducted a prospective study, analysing patients that come to a supra-aortic trunk sonography at our institution, between Juny 01, 2008 and April 30, 2011.

Reports and sonography images were performed by Radiologists.

1.1. PATIENTS

Only 12 out of 2492 patients met the inclusion criteria (see Inclusion Criteria later). We collected sex, age, cardiovascular risk factors (hypertension, diabetes and hyperlipidemia), suspected diagnosis before the sonography, and diagnosis and treatment management after the diagnosis.

Our patients were all of them older than 10-year-old, since our Hospital doesn't attend pediatrics, and with no maximum age requirements.

1.1.1. INCLUSION CRITERIA

Patients examined by supra-aortic trunks sonography.

1.1.2. EXCLUSION CRITERIA

Patients previously diagnosed with subclavian steal coming for a control.

1.2. SONOGRAPHIC TECHNIQUE

It is possible a vertebral artery segments analysis using sonography. We make a routine study only of the V1 and V2 segments.

Vertebral artery origin is visualized by Duplex sonography in up to 85% of patients (being the right side easier).

V2 segment is visualized in about 95% of the patients. If the sonography fails to manifest the artery, either a hypoplastic artery or an occlusion may be present, and the diagnosis cannot be made with sonography alone (figure 3).

V3 segment can be studied after the C1 transverse process. The time required for the artery detection at this level, and since the information provided is almost the same as in the proximal segments, makes the V3 sonography expendable.

The segment V4 is intracranial, and can be studied with transcranial sonography.

1.2.1. NORMAL DOPPLER PARAMETERS
The Doppler parameters that can be reported are: vessel diameter, waveform contour analysis, peak systolic velocity and peak diastolic velocity.

The vertebral artery normal diameter is approximately 4mm, being normally the left artery wider than the right. Since the diameter has no practical approach, its a data not included in this study.

The spectral waveform is anterograde and has a low resistance pattern.

The V2 segment peak systolic velocity is between 20 and 60cm/s. Although this range is not clear in the literature, a 10cm/s peak systolic velocity is probably abnormal, and a peak higher than 100cm/s is probably indicative of a significant stenosis.

The V2 segment peak diastolic velocity mean is 17cm/s.

Due to diameter asymmetry, a high difference between peaks can be expected comparing one side with the other in healthy subjects.

1.2.1. TECHNIQUE

We used a General Electric Logic 9 for the sonography studies. For the best record of the vertebral artery as it runs between the transverse processes, a 7.5MHz or higher lineal transducer is mandatory (we used a General Electric 10MHz lineal probe).

All the sonographic studies were performed by Radiologist with a wide experience making supra-aortic trunks Doppler ultrasound.

The vertebral artery is best depicted in decubitus supine patient, with extended neck. Sometimes is necessary a head rotation for an optimal visualization.

For the vertebral artery localization is useful to localize first the common carotid artery (or its bifurcation) in a B mode longitudinal section. After the common artery localization the array is displaced posteriorly (in longitudinal section too). In short neck patients an anterior window can be used. Acoustic shadows due to transverse processes will appear then, with the vertebral artery between them.

Once the vertebral artery is in the screen, we used the color Doppler technique to show the flux direction.

After the flux direction is recorded, we use the Doppler to record the waveform, detecting pattern anomalies and the peak systolic velocity.

Usually, we only study the V2 segment in a routinary sonography. That basic study allows to differentiate between normal and abnormal vertebral artery. Nevertheless, a V1 segment study is suggested, particularly its ostium.
The V1 segment is studied moving the probe caudally from the V2 segment, or directly from its origin in the subclavian artery.

The supra-aortic and subclavian arteries origin is not recorded due to low performance.

Provocative maneuver were not routine performed, unless subclavian steal syndrome was clinically suspected.

1.3. **STATISTICAL ANALYSIS**

Since the subclavian steal is rare entity, the number of patients collected is not sufficient to make a quantitative analysis, making necessary a descriptive analysis.
Fig. 3: Picture 1.

© Radiodiagnostico, HGU Reina Sofia, HGU Reina Sofia - Murcia/ES
Results

We found 12 patients with sonography proven subclavian steal, 6 (50%) males and 6 (50%) females.

The minimum observed age was 51 year-old, and the maximum 90 year-old.

All patients were Caucasians.

Only 2 patients out of the 12 presented cardiovascular risk factors, 6 presented one risk factor, three of them two, and one presented the three risk factors collected (Figure 1).

Only two of our patients were suspected to have a posterior circulation event, and neither of them were suspected to have subclavian steal syndrome.

Most of our patients suffered from a complete subclavian steal syndrome, and only one of them was diagnosed of subclavian steal syndrome.

After the sonography diagnosis, a CT Angiography or a MR Angiography were performed in order to identify the subclavian artery stenosis. Three of our patients were studied with percutaneous Angiography, and three of them were studied with sonography alone.

The treatment of our patients, after the diagnosis, was conservatory, and only the patient with the syndrome was treated with balloon dilatation angioplasty.
Fig. 1: Figure 1.

© Radiodiagnostico, HGU Reina Sofia, HGU Reina Sofia - Murcia/ES

Fig. 2: Figure 2.
Conclusion

Doppler ultrasonography of the vertebral arteries should be a systematic exploration along the carotid artery. It's important not to focus only when specific pathology is suspected.

US allows a proper approximation to the vertebral pathology, with objetiviable parameters like sistolic and diastolic velocities and flow direction.

The US information can be extrapolated to the information provided by MR Angiography, the former being superior in the diagnosis of subclavian steal syndrome.


