AJNR

Digital angiography of pulsatile masses in the neck.

C F Lanzieri, M Sacher and P M Som

AJNR Am J Neuroradiol 1985, 6 (3) 415-418
http://www.ajnr.org/content/6/3/415

Digital Angiography of Pulsatile Masses in the Neck

Charles F. Lanzieri[1]
Michael Sacher[1]
Peter M. Som[1,2]

Twenty-six consecutive patients with pulsatile neck masses were studied with digital subtraction angiography (DSA) by venous injection, computed tomography (CT), and conventional direct angiography. The neck masses proved to be secondary to tortuous and ectatic carotid or subclavian arteries in 13 cases, resulted from subclavian artery aneurysms in three cases, and resulted from tumor in 10 cases. DSA alone was sufficient for diagnosis in 16 of 26 cases. CT was performed in 15 cases and was contributory in 10. It was most useful when a tumor was demonstrated or suspected on DSA. Conventional angiography was performed in six cases. It contributed no useful information when arteriosclerotic vascular changes were the source of the neck mass, and added useful diagnostic information in only two of 10 neck tumors.

Digital subtraction angiography (DSA) of the cervical and cranial circulation by venous injection is well established as a primary diagnostic method [1–9]. It is accepted as a safe, reliable, and cost-effective way of evaluating arteriosclerotic vascular disease involving the carotid, subclavian, vertebral, and basilar arterial systems [4, 5, 10, 11]. In many cases, it has been the definitive test for evaluating primary extracranial vascular disease as well as some intracranial tumors, and it has obviated preoperative angiography in these patients [10, 11]. The use of DSA in the evaluation of patients with a pulsatile neck mass has not been emphasized [12]. The purpose of our report is to delineate the role of DSA in establishing a precise differential diagnosis in patients with pulsatile neck masses and to show the utility of DSA in limiting or directing further workup in these cases.

Materials and Methods

In our institution, the initial examination in a patient with a pulsatile neck mass depends primarily on which clinical service refers the patient to radiology. If the consultant is a neurologist or vascular surgeon, DSA or conventional angiography is usually requested; whereas, if an otolaryngologist refers the patient, computed tomography (CT) is usually the initial study ordered. Working within this system, we selected the first referral group as the primary source of our study.

Twenty-six consecutive patients with pulsatile neck masses who had DSA as the initial diagnostic study were chosen. At our institution, DSA is carried out via a central venous catheter using a bolus injection of 35 ml of Renografin-76 as described previously [1–3, 7, 13, 14]. Imaging was performed with a Philips Digital Vascular Imaging System.

Results

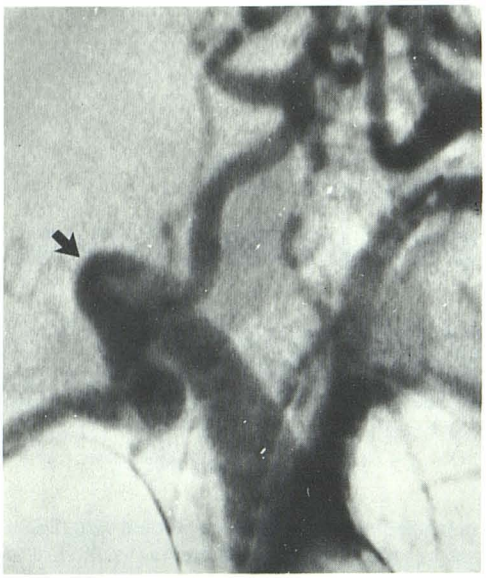
In all 26 cases a presumptive or final diagnosis was made at the time of DSA. Initially, we performed CT as well as DSA in all patients. After performing CT in the first five patients with arteriosclerotic vascular disease, the scans were discontinued because no new diagnostic information was contributed by CT. In addition, in several cases the diagnosis could not be made from the CT scan alone. In either

Received March 26, 1984; accepted after revision September 25, 1984.

[1] Department of Radiology, Mount Sinai Medical Center and School of Medicine of the City University of New York, New York, NY 10029. Address reprint requests to C. F. Lanzieri, Mount Sinai Hospital, One Gustave L. Levy Pl., New York, NY 10029.

[2] Department of Otolaryngology, Mount Sinai Medical Center and School of Medicine of the City University of New York, New York, NY 10029.

AJNR 6:415–418, May/June 1985
0195-6108/85/0603-0415

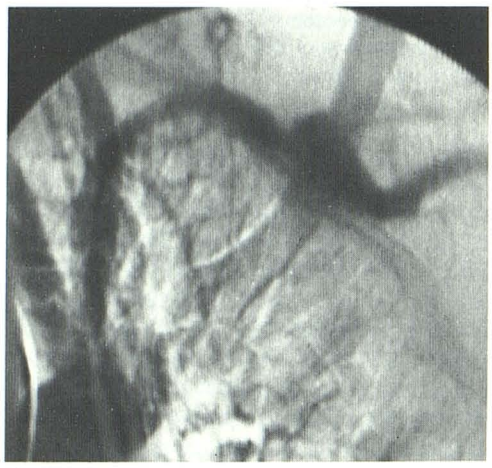


1

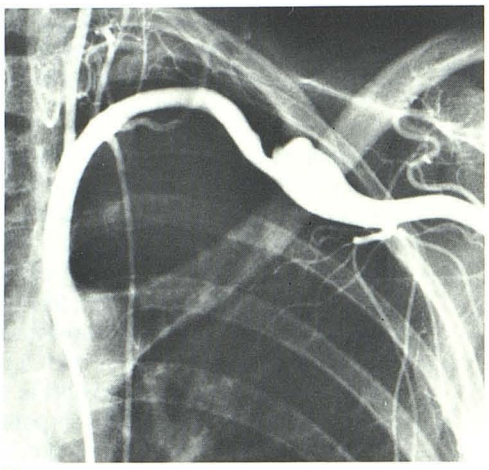
2

Fig. 1.—Elderly woman with pulsatile neck mass above right clavicle. Arterial phase of DSA, right anterior oblique projection. Ectatic and redundant brachiocephalic artery projecting into supraclavicular fossa (*arrow*). No further workup was undertaken.

Fig. 2.—Middle-aged man. Pulsatile mass was seen bulging into oropharynx on oral examination. Arterial phase of DSA, posteroanterior view. Tortuous and redundant cervical part of right internal carotid (*arrows*).



A



B

Fig. 3.—DSA (**A**) and conventional angiographic (**B**) demonstration of subclavian artery aneurysm. Added detail afforded by angiography did not alter surgical plan.

case, the CT scan did not influence the diagnosis or ultimate therapy in these patients. Subsequently, CT scans were obtained only in patients thought to have tumors. These studies contributed useful information in all cases; specifically, the accurate mapping of these lesions for treatment planning was only attainable with the information acquired from CT.

Conventional angiography was performed in only six cases and contributed additional useful information in only two instances. The combination of DSA and CT was believed to have obviated diagnostic angiography in many of our patients.

In 13 cases, the cause of the pulsatile neck mass was found to be secondary to tortuous and ectatic carotid or subclavian arteries (fig. 1). In one of these a parapharyngeal space pulsatile mass was shown to represent a tortuous cervical part of the internal carotid artery (fig. 2). Three patients had subclavian artery aneurysms diagnosed by DSA; one of the patients underwent confirmatory subclavian artery angiography (fig. 3). In eight cases, DSA revealed subtle narrowing or displacement of one of the carotid vessels indicating a neck mass (fig. 4). Two vascular masses in the neck were demonstrated by DSA: a renal metastasis (fig. 5) and a carotid body tumor (fig. 6).

Discussion

DSA has been shown to be a safe and effective method of evaluating the carotid and vertebral vessels for arteriosclerotic vascular disease and for some of the more common intracranial tumors [1–11, 13]. The use of DSA in the workup of pulsatile neck masses has not been emphasized in the liter-

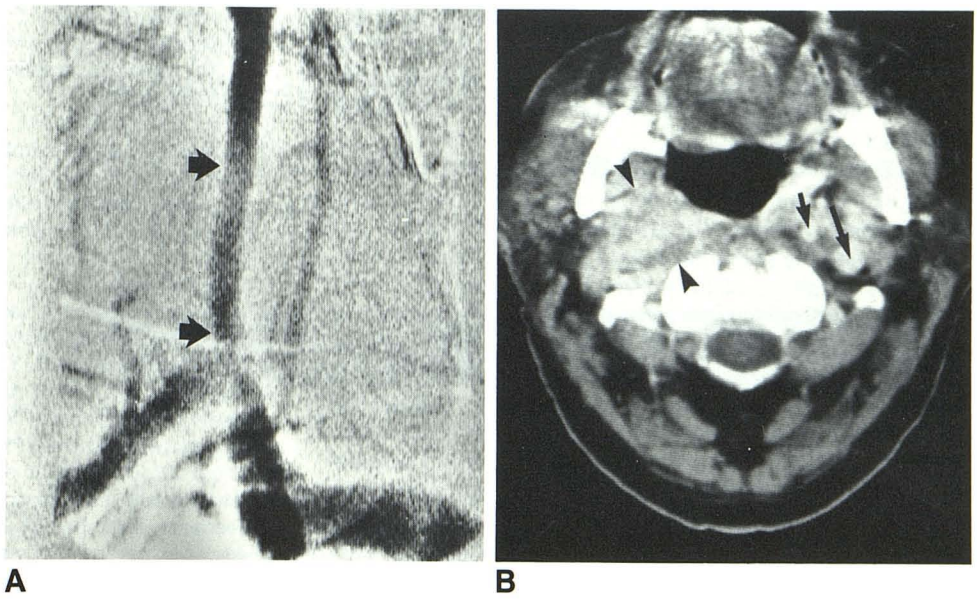


Fig. 4.—**A**, DSA, posteroanterior projection. Subtle narrowing suggestive of encasement of right common carotid artery (*between arrows*). **B**, Postcontrast CT scan, axial view. Infiltrating process in right parapharyngeal space obliterates carotid sheath structures (*arrowheads*). Left internal carotid artery (*short arrow*) and left internal jugular vein (*long arrow*) are not encased and are seen clearly.

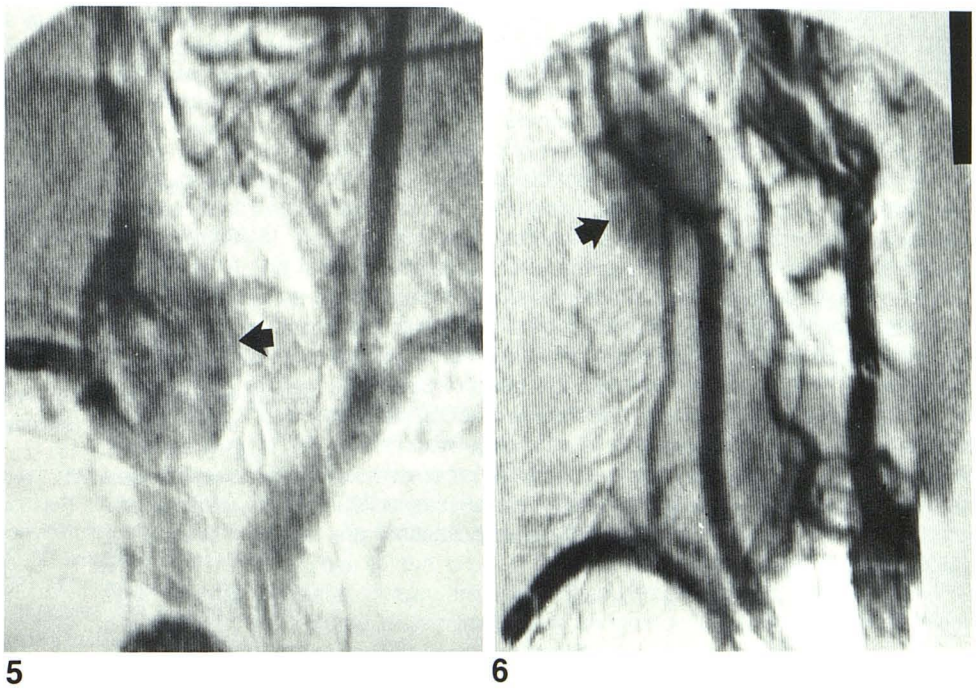


Fig. 5.—Middle-aged man with pulsatile neck mass in root of neck on right. DSA, arterial phase. Dense tumor stain (*arrow*). CT scanning was performed to map tumor size; conventional angiography was avoided. Metastatic hypernephroma was found at surgery.

Fig. 6.—Middle-aged woman with pulsatile mass near angle of mandible. DSA, right anterior oblique projection. Early tumor stain (*arrow*) separating internal and external carotid arteries. Dynamic CT scanning confirmed diagnosis of carotid body tumor.

ature. Our material indicates that if DSA is performed as the first examination, it is definitive or very suggestive of the final diagnosis. CT and conventional angiography can be eliminated from the workup in many cases and limited to specific instances where they are indicated from the DSA findings.

In our series the largest group of patients were found to have arteriosclerotic vascular disease (tortuosity, ectasia, or aneurysm) as the cause of their pulsatile neck mass. Tortuosity, coiling, and kinking of the brachiocephalic arteries was described angiographically by Weibel and Fields [15, 16]. DSA demonstrates these changes quite adequately. We do not believe that any diagnostic information is sacrificed by using only DSA in this population of patients, who, since they are more likely to have arteriosclerotic disease, have an increased angiographic morbidity [17].

Pairolero et al. [18], in their extensive series of subclavian and axillary artery aneurysms, described the etiology, diagnosis, and therapy of these lesions. The aneurysms can have arteriosclerotic, traumatic, or congenital etiologies and also are seen in thoracic outlet obstruction. They almost always

accompany a pulsatile neck mass, and occasionally this is the only presenting complaint [18]. DSA is quite useful for the evaluation of these lesions, and, on the basis of our experience with three cases, we do not believe that confirmatory angiography is necessary.

At its present level of resolution, DSA is less than definitive for the evaluation of pulsatile neck masses that have a neoplastic etiology, although occasionally the DSA findings can suggest a specific entity, such as a carotid body tumor [12, 19, 20]. In our series, all the pulsatile neck masses that were believed to be neoplastic based on the DSA findings of carotid narrowing or displacement or tumor blush went on to the more definitive CT examination. DSA was useful in that it suggested the diagnosis in these cases and thus directed the subsequent radiographic investigations in this specific patient population. The combination of DSA and CT reliably identified encasement and/or displacement of the carotid artery and accurately mapped the tumor extent. Although conventional angiography could better define subtle arterial encasement, this refined information did not alter the DSA diagnosis. The conventional angiogram did demonstrate subtle tumor stain or neovascularity not well seen on DSA; however, this information did not alter the therapeutic approach to the patient and was not considered to justify the additional patient morbidity of a conventional angiogram. Preoperative embolization, which greatly reduces operative blood loss, is a most important technique for patients with tumors.

In conclusion, the differential diagnosis of pulsatile masses in the neck includes tortuous and ectatic great vessels or their branches; subclavian or axillary artery aneurysms; transmitted pulsations through masses that are adjacent to or encasing the carotid artery; and primary or metastatic vascular tumors. DSA is a safe and effective method of limiting the differential diagnosis and directing further workup in these patients. By using DSA as a screening procedure, a more efficient role for CT was attained. On the basis of our experience with a variety of pathology, we believe that DSA should be the first step in the evaluation of a pulsatile neck mass. When DSA raises the suspicion of a neoplastic process in the neck, CT is quite likely to contribute all the necessary useful information, and, except for preoperative embolization, angiography is rarely needed.

REFERENCES

1. Manelfe C, Ducos de Lahitte M, Marc-Vergnes J-P, et al. Investigation of extracranial cerebral arteries by intravenous angiography: report of 1,000 cases. *AJNR* **1982**;3:287–293
2. Wood GW, Lukin RR, Tomsick TA, Chambers AA. Digital subtraction angiography with intravenous injection: assessment of 1,000 carotid bifurcations. *AJNR* **1983**;4:125–129, *AJR* **1983**; 140:855–859
3. Chilcote WA, Modic MT, Pavlicek WA, et al. Digital subtraction angiography in the carotid arteries: a comparative study in 100 patients. *Radiology* **1981**;139:287–295
4. Modic MT, Weinstein MA, Chilcote WA, et al. Digital subtraction angiography of the intracranial vascular system: comparative study in 55 patients. *AJNR* **1981**;2:527–534, *AJR* **1982**; 138:299–306
5. Kaseff LG. Positional variations of the common carotid artery bifurcation: implications for digital subtraction angiography. *Radiology* **1982**;145:377–378
6. Mistretta CA, Crummy AB, Strother CM. Digital angiography: a perspective. *Radiology* **1981**;139:273–276
7. Seeger JF, Weinstein PR, Carmody RF, Ovitt TW, Fisher D, Capp MP. Digital video subtraction angiography of the cervical and cerebral vasculature. *J Neurosurg* **1982**;56:173–179
8. Riederer SJ, Kruger RA. Intravenous digital subtraction: a summary of recent development. *Radiology* **1982**;147:633–638
9. Eskridge JM, Becker GJ, Rabe FE, Holden RW, Klatte EC. Digital vascular imaging: practical aspects. *Radiology* **1983**;148:703–705
10. Modic MT, Weinstein MA, Starnes DL, Kinney SE, Duchesneau PM. Intravenous digital subtraction angiography of the intracranial veins and dural sinuses. *Radiology* **1983**;146:383–384
11. Carmody RF, Smith JRL, Seeger JF, Ovitt TW, Capp MP. Intracranial applications of digital intravenous subtraction angiography. *Radiology* **1982**;144:529–534
12. Kinney SE, Modic MT, Starnes D, Weinstein MA, Duchesneau PM. Digital subtraction angiography of lesions of the head and neck. *Laryngoscope* **1982**;92:557–561
13. Crummy AB, Steighorst MF, Turski PA, et al. Digital subtraction angiography: current status and use of intra-arterial injection. *Radiology* **1982**;145:303–307
14. Modic MT, Weinstein MA, Pavlicek W, et al. Intravenous digital subtraction angiography: peripheral versus central injection of contrast material. *Radiology* **1983**;147:711–715
15. Weibel J, Fields WS. Tortuosity, coiling and kinking of the internal carotid artery: I. Etiology and radiographic anatomy. *Neurology* (NY) **1965**;15:7–18
16. Weibel J, Fields WS. Tortuosity, coiling and kinking of the internal carotid artery: II. Relationship of morphological variation to cerebrovascular insufficiency. *Neurology* (NY) **1965**;15:462–468
17. Hessel SJ, Adams DF, Abrams HL. Complications of angiography. *Radiology* **1981**;138:273–281
18. Pairolero PC, Walls JT, Payne WS, Hollier LH, Fairbrain JF. Subclavian axillary artery aneurysms. *Surgery* **1981**;90:757–762
19. Shugar MA, Mafee MF. Diagnosis of carotid body tumors by dynamic computed tomography. *Head Neck Surg* **1982**;4:518–521
20. Ward PH, Jenkins HA, Hanafee WN. Diagnosis and treatment of carotid body tumors. *Ann Otol* **1978**;87:614–621