REFERRED PAIN FROM THE ADRENAL AREA DURING SELECTIVE RENAL ANGIOGRAPHY

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WHEREAS numerous diseases affect the adrenal gland, pain as a symptom is rare. A review of the literature indicates that pain in the abdomen or in the costovertebral region is sometimes encountered. However, a consistent reference of pain from the adrenal area is not generally recognized. During the procedure of selective renal angiography in a series of 65 patients, 5 patients have experienced pain in the chest. Analysis of this discomfort in relationship to pain referred from the adrenal area is the subject of this report.

Injection of radiographic contrast material into peripheral arteries is usually associated with subjective discomfort in the region supplied by the artery. Representative examples are pain in the shoulder from injection of the costocervical trunk of the subclavian artery, discomfort in the thyroid and laryngeal region from injection of the thyrocervical trunk of the subclavian artery, pain in the face from injection of the external carotid artery, and pain in the back from injection of a lumbar artery. This pain, generally ascribed to the irritating effect of the contrast agent, is usually sharp, burning in character, and brief, lasting from 5 to 10 seconds after the injection. This pain is followed by a feeling of warmth in the part injected. The intensity of the pain is usually directly proportional to the concentration and type of the opacifying medium.

Other arteries that are opacified rarely produce symptoms. Injection of contrast material into the splenic artery, the hepatic artery, and the mesenteric arteries usually produce no symptoms other than a mild feeling of warmth.

Selective renal arteriography employing the Seldinger technic[1] under local anesthesia has been utilized in this series in 65 patients. Direct injection of the contrast material into the renal arteries does not usually produce discomfort. In the early experience with this technic of selective angiography, several patients described chest discomfort immediately after the injection. The symptom was generally mild. An accurate description of it and a correlation with the type of opacification was not sought. However, there have been five patients recently who have had severe chest discomfort, and they have been questioned closely concerning the type and location of pain.

Anatomy

The renal arteries arise from the abdominal aorta as single trunks in from 75 to 80 per cent of patients. In the remaining patients, more than one vessel arises separately from the abdominal aorta. As a rule only the inferior adrenal artery arises from the renal arteries. Rarely, the inferior phrenic artery and the superior

and middle adrenal arteries arise as a branch of the renal artery. When there is more than one renal artery supplying the kidney, the adrenal artery or arteries arise from the superior renal artery.

Brief Representative Case Reports

The anatomy of the first patient is similar in almost all respects to three other patients, all of whom had solitary renal arteries. The second case provides a unique experience in analysis of discomfort associated with injection of contrast medium into the adrenal and renal arteries, since double renal arteries were present bilaterally.

Case 1. A 42-year-old man, a purchasing agent, was referred for angiography in the course of investigation of arterial hypertension. His blood pressure before arteriography was 210/120 mm. of Hg. He had previous episodes of congestive heart failure that was compensated at this time. A recent electrocardiogram revealed a questionable old anteroseptal infarct. Following administration of local anesthesia a catheter was introduced percutaneously into the right femoral artery and was passed into the aorta to the level of the renal arteries. An aortic injection of 10 ml. of 50 per cent Hypaque sodium was made, and disclosed single renal arteries bilaterally. The catheter was then passed into the right renal artery, and 4 ml. of contrast material was injected for radiography of the arterial supply of the kidney. The patient promptly described a sharp pain that was located in the right lower anterior part of the chest, lasting approximately 5 seconds and followed by a feeling of warmth in that region. The radiograph of the injection disclosed the catheter to be located in the renal artery with its tip lying immediately beneath the adrenal artery. The catheter was withdrawn into the aorta and was manipulated into the left renal artery. A similar injection of 50 per cent Hypaque sodium was made and the patient again promptly noted a sharp deep-seated midline chest pain that he described as "a pain in the heart." The characteristics of the pain were similar to those described upon injection of the right renal artery. Again, the pain was fleeting. The angiography was completed after additional injection into both renal arteries, each time reproducing the pain described.

Case 2. A 34-year-old college professor with arterial hypertension was examined to determine whether or not a renal arterial lesion was associated with the hypertension. The blood pressure before the examination was 152/110 mm. of Hg. The catheter was introduced percutaneously into the right femoral artery after administration of local anesthesia, and was directed into the abdominal aorta. An aortic injection disclosed two renal arteries to each kidney, which originated separately from the aorta. The superior right renal artery was selectively catheterized; when it was opacified, the patient immediately experienced sharp deep midline chest pain, which was localized to the precordium. In a few seconds the discomfort subsided. A radiograph made at the time of this injection revealed the adrenal artery to be a branch of this superior renal artery. The catheter was then passed into the inferior right renal artery and was injected with 4 ml. of 50 per cent Hypaque sodium. No discomfort resulted. A similar variation in the arterial anatomy was present on the left side. The superior left renal artery, from which the adrenal artery originated, was opacified and resulted in pain with identical characteristics and was referrable again to the precordium. Similarly, selective injection of contrast material into the inferior left renal artery, from which no adrenal branch originated, resulted in no discomfort. Since the symptom was so striking, the catheterization of the renal arteries was repeated. This was done in random fashion and not following the original pattern of catheterization and injection of contrast material. The symptom of chest pain was produced in response to three injections made into the superior renal arteries from which the adrenal arteries arose. Likewise, no discomfort resulted from injection of either of the inferior renal arteries.

Discussion

Localization of pain from the adrenal areas is generally poorly defined. Pain originating in the adrenal region occurs mainly in patients who have adrenal hemorrhage or adrenal tumor. In the case of adrenal hemorrhage, blood is often found beneath the diaphragm, so that the symptoms are often confused with the diaphragmatic irritation as evidenced by pleuritic and shoulder pain. In addition, the symptoms of adrenal hemorrhage are often masked by the consequences of acute adrenal failure.

It is recognized that this symptom of chest pain could be produced by the irritating effect of the contrast material filling the inferior phrenic artery should it arise as a branch of the renal artery. This possibility is unlikely statistically according to the work of Boijsen.[2] The inferior phrenic artery in his series of 100 cases originated from the renal artery in only three instances. Moreover, the inferior phrenic artery is considerably larger than the adrenal artery and would not likely be confused with it.

Conclusion

Experience with patients undergoing selective renal angiography when the adrenal artery is opacified and is subjected to the irritating effects of the contrast material seems to indicate that adrenal pain may present as chest pain, and may be referred either to the low anterior part of the chest or to the retrosternal region, simulating cardiac pain. Knowledge of this possible referral pathway may have important application in the differential diagnosis of patients having pain simulating cardiac pain but originating from the adrenal region.

References

1. Seldinger, S. I.: Catheter replacement of needle in percutaneous arteriography; new technique. Acta radiol. **39:** 368-376, 1953.

2. Boijsen, E.: Angiographic studies of anatomy of single and multiple renal arteries. Acta radiol. supp. **183:** 1-135, 1959.