

Occluded left main stem coronary artery

Report of five patients and review of published reports

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SUMMARY Five patients aged 24 to 62 years presenting with a long history of angina were found to have complete occlusion of the left main coronary artery. In one patient the right coronary artery was also completely blocked. All patients had a dominant right coronary artery which was significantly diseased in only one patient. Ventricular function was severely impaired in only one patient. These patients illustrate the importance of collateral information in this condition. Coronary bypass grafting was performed in three patients who are now symptomatic at follow-up between nine and 17 months.

Complete occlusion of the left main stem coronary artery is a very unusual manifestation of coronary atheromatous disease, and to our knowledge only 64 examples have been reported in the English language journals^{1,2} of which 57 are reviewed in a recent report.² In this brief report we describe the clinical and angiographic findings in five patients investigated at the Brompton Hospital.

Patients and methods

Between 1970 and 1982 a total of 11 900 patients underwent coronary arteriography at the Brompton Hospital. Of these, six patients (0.04%) had complete occlusion of the left main stem coronary artery. One of these patients had had previous vein bypass grafting and was excluded from this analysis. The five remaining patients had been referred for coronary arteriography. Left heart catheterisation was performed via the right brachial artery. Left ventriculography was conducted in the right anterior oblique view and right and left selective coronary arteriography was filmed in several standard projections.

Results

The clinical details of these patients are summarised in Table 1. Four patients were men and one was a woman. Four patients had symptoms suggestive of typical angina pectoris and one had "atypical" chest pain. On patient (case 1) had Hodgkin's disease. The

findings at catheterisation are summarised in Table 2. Three patients had normal left ventriculograms, one had inferior akinesis and anterior hypokinesis of the left ventricle, and one patient had global left ventricular dysfunction. The left ventricular end-diastolic pressure was much raised in only one patient. The right coronary artery was dominant in all patients. Minor right coronary disease was seen in one patient, moderate stenosis in another, and complete occlusion 2 cm from the origin in another. The right coronary artery was completely normal in two patients. In all patients, the left main stem was completely occluded at between 0.5 and 1.5 cm from its origin (Fig. 1). Retrograde filling of the circumflex and anterior descending branches of the left coronary artery was seen in all cases (Fig. 2). Early rapid filling with good opacification of the distal left coronary tree was seen in one patient with less brisk but complete opacification of the left coronary tree in three others. In the patient with bilateral coronary occlusion, indistinct distal filling occurred via collaterals.

Three patients have undergone coronary artery bypass grafting and are free of symptoms at nine to 16 months follow-up. One patient refused operation and was alive two years later but is now lost to follow-up. The patient with Hodgkin's disease who had been treated medically died suddenly six months after investigation.

Discussion

The prevalence of complete obstruction of the left main coronary artery is unknown. In patients who are investigated in the catheter laboratory prevalence var-

Table 1 Clinical data

Case No.	Sex	Age (y)	Symptoms	Duration	History of myocardial infarction	Resting electrocardiogram at time of catheterisation	Chest x-ray
1	M	24	Angina pectoris	19/12	No	Normal	Increased heart size
2	M	62	Angina pectoris, unstable angina	12 y	Yes	Lateral ischaemia, left axis deviation, inferior myocardial infarction	Normal
3	M	56	Angina pectoris	11 y	No	Lateral ischaemia	Normal
4	M	53	Angina pectoris	1/12	No	Normal	Normal
5	F	49	Angina pectoris, unstable angina	18/12	No	Anterior ischaemia	Normal

Table 2 Catheterisation data

Case No.	Left ventricular angiogram	LVEDP (mm/Hg)	Coronary angiography	Distal filling of left coronary artery
1	Global dysfunction	7	LMSO 1.5 cm, normal DRCA	++
2	Inferior akinesia, anterior hypokinesia	29	LMSO 0.5 cm, occluded DRCA	+
3	Normal	18	LMSO 1.0 cm, moderate DRCA stenosis	++
4	Normal	12	LMSO 1.0 cm, mild DRCA stenosis	++
5	Normal	15	LMSO 2.0 cm, normal DRCA	+++

LVEDP, left ventricular end-diastolic pressure; LMSO, left main stem occlusion; DRCA, dominant right coronary artery.

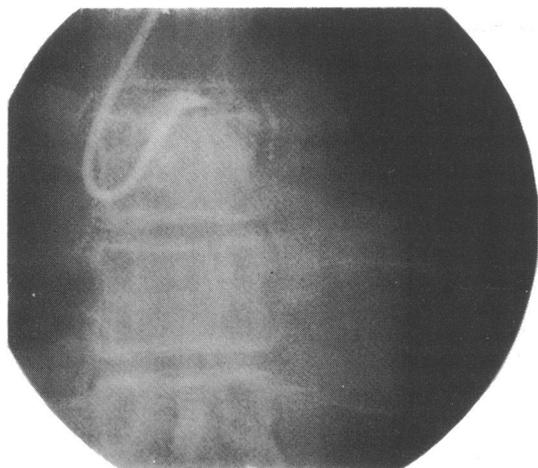


Fig. 1 Complete occlusion of the left main coronary artery at about 1.5 cm from the origin. (Anteroposterior projection, case 3.)

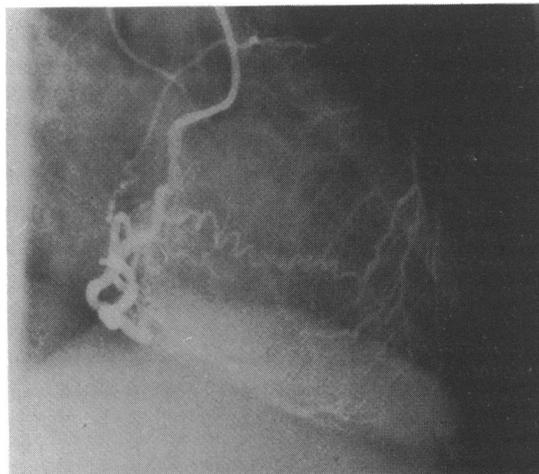


Fig. 2 The left coronary tree is filled from a normal dominant right coronary artery via extensive collaterals. (Right anterior oblique view, case 5.)

Table 3 Treatment and follow-up

Case No.	Surgery	Follow-up
1	—	Died 6 mth (lymphoma)
2	LAD, ALCX	16/12 pain free
3	RCA, ALCX, LAD	9/12 pain free
4	—	Alive 2 y angina
5	LAD, CX	17/12 pain free

LAD, left axis deviation; ALCX, left circumflex; RCA, right coronary artery; CX, circumflex.

ies from 0.04%³ to 0.4%.⁴ The rarity of the lesion may be accounted for by a high incidence of death in these patients. Necropsy studies of a large number of patients with left main stem disease, however, showed no cases of complete obstruction.⁵

Left main coronary artery stenosis is usually accompanied by significant disease elsewhere in the coronary tree,⁶ which, it has been suggested, may lead to symptoms and presentation before complete obs-

truction occurs.² Though right coronary artery disease in this setting is easily shown by angiography, distal left coronary artery stenoses are more difficult to define because opacification of these vessels is dependent on collateral flow. Therefore, the prevalence and severity of distal left coronary disease in patients with left main occlusion are not known. In patients with normal or near normal left ventricular function it is unlikely that significant distal left coronary artery disease is present.

The right coronary artery was dominant in all cases. Review of previous reports quoted by Zimmern *et al.*² and one additional report¹ shows that all 26 patients with occluded left main stem had a dominant right coronary artery. This observation suggests the importance of a dominant right coronary artery in collateral development. The extent of associated right coronary artery disease is variable. A review of the published reports^{1,2} shows that 20/40 patients had significant (>50% stenosis) right coronary artery disease. In one of our cases, the right coronary artery was also totally occluded. Thus, significant right coronary artery disease *per se* does not seem to impair collateral development.

Several previous reports^{1,2} have emphasised the importance of collateral formation in patients with an occluded left main stem. Some salient features emerge from these reports. Preservation of left ventricular function appears to be related to "substantial" collateral flow. This view is supported by evidence described by Levin⁷ and Hamby *et al.*⁸ though others disagree.^{9,10} Presumably, the functional significance of the collateral channels is determined to some extent by the setting in which they develop.¹¹⁻¹³ That the rate of progression of coronary artery disease is an important determinant of collateral formation is suggested by the experiments of Khouri *et al.*¹⁴ In our series, three patients had normal left ventricular function and only one had severe left ventricular impairment. A review of the studies providing these data^{1,2} shows that only 19/46 patients had severe left ventricular dysfunction and five had a normal left ventricle. Though extensive collateral development may preserve left ventricular function in these patients, it is not sufficient to prevent angina.¹⁵ Of our five patients, four had had anginal symptoms from 18 months to 12 years. Other studies^{1,2} also note a long duration of symptoms. This observation may imply that the progression of left main stem disease in many of these patients is very slow, allowing the development of collaterals which become increasingly important as total occlusion approaches.

Surgery is the treatment of choice in left main coronary artery stenosis⁶ and is probably appropriate in left main stem occlusion. Certainly, it seems unwise to rely on the integrity of the often diseased dominant

right coronary artery to supply collaterals.¹⁶ A potential problem in selecting patients for surgery is poor visualisation of the distal left coronary artery and therefore difficulty in knowing whether these vessels are graftable and where the distal insertion should be sited. Review of published follow-up data^{1,2} shows that 34 of 39 (87%) (including the present series) patients treated surgically and nine of 15 (60%) patients treated medically were alive at the time of writing. Of the 34 surgically treated patients alive, 28 (82%) were asymptomatic compared with four (44%) of the medically treated patients. These figures appear to favour surgical rather than medical treatment though they do not constitute hard evidence.

Conclusion

Left main stem occlusion is rarely seen at coronary angiography. Right coronary artery dominance seems to occur in all patients. Collateral flow is important in preserving left ventricular function but is usually insufficient to prevent angina. A long history of angina is common. Surgical treatment is appropriate.

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