The Role of Thrombolysis in the Management of Thromboembolic Disorders: A Four-Year Review

P. A. Sylvester, A. H. Davies, A. Holgate, E. Nathanson, P. Murphy, R. N. Baird and P. M. Lamont

Department of Surgery, Bristol Royal Infirmary, Bristol, U.K.

Objective: To examine the role of thrombolysis alone, or in conjunction with surgery and angioplasty, in the treatment of thromboembolic disorders.

Design: A retrospective review of 70 patients, who received thrombolysis on 73 occasions between 1990 and 1993.

Patients and methods: Four groups were defined: (1) thrombolysis alone (40%); (2) thrombolysis followed by angioplasty (23%); (3) thrombolysis followed by surgery (13%) and (4) thrombolysis after failed angioplasty (24%).

Results: Twenty-eight patients (40%) received thrombolysis alone of which 13 were successful. In 25 cases (36%) thrombolysis was initially successful in that it permitted further angioplasty or surgical reconstruction. This adjunctive treatment was successful in 16 cases. Overall, when used as a first-line treatment, thrombolysis was successful in 72% of cases. Success in this context includes those in which a further procedure was possible after thrombolysis. These groups included 20 occluded grafts in which thrombolysis played an important part in unblocking 13 (65%) of them. In a separate group of 17 patients (24%) thrombolysis was given after failed angioplasty and was successful on 15 (88%) occasions. Local complications occurred in 17 patients. There were three deaths. There were no intra-cerebral haemorrhages.

Conclusions: Thrombolysis alone can be used successfully. There is a large group in which thrombolysis can help to increase the success rate of interventional radiology.

Key Words: Intra-arterial thrombolysis; Arterial thromboembolism; Graft occlusion.

Introduction

Increasingly, the relative merits of surgery, angioplasty and thrombolysis in the management of thromboembolic disorders are being discussed. The development of the Fogarty catheter in 1963 increased the success rate of surgical embolectomy. This was the accepted first-line treatment of most embolic occlusions. However, the place of surgical and non-surgical techniques in the management of embolic and thrombotic disorders, is far from clear.

Even though streptokinase was discovered in 1933, it was not until 1962 that Cotton et al. described its intra-arterial use in the treatment of thrombosed popliteal aneurysms. The last five years has seen an increase in the use of both streptokinase and rtPA in the treatment of thromboembolic disease.

In this study, we review our four-year experience of thrombolytic therapy. The two main objectives were: (1) to define the pattern of thrombolytic usage and (2) to establish whether thrombolysis alone is a successful treatment of thromboembolic disorders.

Patients and Methodology

The case notes of 70 patients receiving thrombolysis between 1990 and 1993 were reviewed retrospectively. Three of these had two separate episodes or limbs requiring thrombolysis. There were, therefore, 73 occasions on which thrombolysis was given.

Exclusion from thrombolysis

The following situations were considered absolute contraindications for thrombolysis: (a) immediate limb threatening ischaemia, amenable to surgery; (b) gastrointestinal bleeding within the previous 3 weeks; (c) a cerebrovascular event within 2 months; (d)
known bleeding diatheses; (e) recent major trauma or cardiopulmonary resuscitation (CPR). While it is difficult to define ‘recent’ in the above context, most people would not give thrombolysis within 2 weeks of CPR, major trauma or major surgery. Some would wait as long as 6 weeks. The relative contraindications were: (a) peptic ulceration; (b) renal or hepatic failure.

Technique

All patients were consented before the procedure, which was performed in the supine position. An angiographic catheter was introduced, preferably from the contralateral groin, using the Seldinger technique. The sidewinder or multisidehole catheter was then positioned just proximal or just within the occlusion. Streptokinase was infused at a standard rate of 5000 units per hour. This was then increased in some subjects, to a maximum of 20 000 units per hour in one patient. rTPA was infused at a rate of 0.5 mg per hour in 10 ml of normal saline.

After initiating thrombolysis, the patients were closely monitored, either on the intensive care unit or specialist vascular ward, in most cases the latter. Cardiovascular status and the status of the extremity by listening for Doppler signals were assessed hourly.

A check angiogram was performed at 4 h and thereafter at times determined by the findings, usually 4-hourly. Thrombolysis was continued until successful or a further procedure was deemed necessary (i.e. angioplasty or surgery). Thrombolysis was stopped if: (a) no lysis occurred after 4 h; (b) there was failure to progress at any of the subsequent checks; (c) complications intervened or the leg deteriorated.

Results

Fifty patients (71%) were male and 20 (29%) were female. The mean age was 67 years (range 39–85 years). The mean duration of symptoms was 8 days (1 hour to 3 months). Fifty-seven cases (78%) had critical ischaemia on presentation and 16 (22%) had intermittent claudication. Of the 57 patients, the aetiology was an embolus in five, thrombosis of a routine vessel in 36 and a graft occlusion in 16. Critical ischaemia in this context was defined as rest pain with neurological symptoms. Some had additional tissue loss. It was estimated that there was irreversible limb ischaemia in 18 cases before commencing thrombolysis. Fifty-five (79%) patients were present or ex-smokers. Fourteen (20%) had diabetes mellitus and a further 20 (29%) had hypertension. The thrombolytic agent used was streptokinase on 40 occasions (55%) and rTPA on 33 (45%). The average infusion time was 24 hours (range 1–66 hours).

Thrombolysis had to be stopped in three (4%) of the 70 patients. One patient pulled out the angiogram catheter, one fell sustaining a forehead haematoma and one had haemoptysis. Therefore, the results of 70 episodes of thrombolysis are presented.

The use of thrombolysis could be divided into four separate groups: (1) thrombolysis alone; (2) thrombolysis followed by angioplasty; (3) thrombolysis followed by surgery; (4) angioplasty followed by thrombolysis. We define success as functional limb salvage at 30 days in each particular group. The results are illustrated in Fig. 1.

Twenty-eight patients (40%) had thrombolysis alone; of these only two had symptoms of intermittent claudication. Twenty-six had symptoms of rest pain, the duration of symptoms ranging from sudden onset to 6 months. Overall, 13 patients had improved symptoms and hence definitive treatment from thrombolysis alone, with no adjunctive procedure. Three patients in this group had embolic episodes. Two of these were angiographically proven. The third patient had had a myocardial infarction 2 weeks previously and was in atrial fibrillation.

In 25 (36%) thrombolysis was successful but an underlying lesion required a further procedure. In 16 cases, an underlying stenosis amenable to angioplasty could be identified. Angioplasty failed in two cases. There was poor run-off in a further two patients: these were considered failures. These four failures proceeded to successful surgical reconstruction.

In nine cases, thrombolysis improved the run-off sufficiently to allow reconstructive surgery. This was unsuccessful in three cases, of which one had a diagnosis of embolus.

Fig. 1. The overall results of thrombolysis (T = thrombolysis)
Thrombolysis in Thromboembolic Disorders

Table 1. Complications from intraarterial thrombolysis

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
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</thead>
<tbody>
<tr>
<td>Local</td>
<td></td>
</tr>
<tr>
<td>Minor (no transfusion)</td>
<td>11</td>
</tr>
<tr>
<td>Major (transfusion)</td>
<td>6</td>
</tr>
<tr>
<td>General</td>
<td></td>
</tr>
<tr>
<td>Deaths</td>
<td>3</td>
</tr>
<tr>
<td>Haematemesis (no transfusion)</td>
<td>1</td>
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Thrombolysis was used to improve run-off or clear new thrombus after 17 angioplasties. This was successful in 15 cases. In one of these cases, angioplasty was preceded by a suction thrombectomy. A diagnosis of embolus was proven angiographically in this case. In two cases, thrombolysis failed after angioplasty. One of these patients improved radiographically but acquired a surgical thrombectomy. The second patient suffered an arterial dissection and required reconstructive surgery.

Twenty patients (29%) had grafts. There were equal numbers of vein and synthetic grafts (Fig. 2). Thrombolysis helped unblock 13 (65%) grafts successfully. In seven (54%) of these cases, thrombolysis alone was used. Five (38%) had successful redo reconstructive surgery following thrombolysis. One had a successful angioplasty. Four cases (20%) had unsuccessful treatment with thrombolysis alone; all required amputations. In two patients, angioplasty failed after partially successful thrombolysis. These both proceeded to successful surgery. In one further patient, a surgical thrombectomy failed following thrombolysis.

There were 17 local and four general complications. These are listed in Table 1.

In considering the three deaths, one case had a retroperitoneal bleed from the puncture site. One patient suffered a haemoptysis; this may have been secondary to a concurrent pneumonia. The third patient died as a result of a recent myocardial infarction. It should be noted that only one of these deaths was directly attributable to the thrombolysis. There were no intracerebral haemorrhages.

Discussion

The management of acute peripheral ischaemia is a difficult problem. Much has been written on the successful use of intra-arterial thrombolysis. Despite this, few units have reviewed and defined their precise use of thrombolysis.

In cases where thrombolysis was used as a first-line treatment (53 cases), our overall success rate was 72% (38 cases). This includes 25 cases in which thrombolysis succeeded in that it permitted a further procedure such as angioplasty or reconstructive surgery. These further procedures were successful on 18 occasions. Thrombolysis alone was successful in 13 (25%) cases. These figures compare well with pooled data as quoted by Graor and Olin. He quotes success rates of 67% for streptokinase and 90% for rTPA. He, however, does not define what is meant by “successful thrombolysis”. Our figures also compare well with prospective data, where the limb salvage rate is quoted as 55%.

Fig. 2. The results of thrombolysis in occluded grafts (T = thrombolysis)
It should be noted that many of the patients in our study had irreversible ischaemia. The majority of these made up the group of patients in whom thrombolysis alone failed. Thrombolysis in these patients was used in an attempt to avoid almost inevitable amputation.

In 24% of cases, thrombolysis was used to treat arterial occlusion after angioplasty. This was usually due to thrombosis at the angioplasty site or distal emboli. This figure is greater than the 12% quoted in the literature. This group is becoming increasingly important, as our success rate of 88% implies. There is little doubt that thrombolysis will be used increasingly in this role, as interventional radiology becomes more aggressive.

Controversy still exists over the management of occluded grafts. This study found that thrombolysis alone or in conjunction with surgery or angioplasty contributed to the successful management of 65% of the graft occlusions offered thrombolytic therapy. It should be noted that 35% of the total involved thrombolysis alone. Many feel that the best use of thrombolysis in graft occlusion is in conjunction with subsequent reconstructive surgery. Initial success with thrombolysis alone is often complicated by subsequent re-occlusion. This is because the cause for the occlusion has not been removed.

Our local complication rate compared well with average figures. It was notable, however, that there were no intracranial bleeds. This is in contrast to other figures, in which intracerebral bleeding occurs in between 2% and 6% of cases.

In conclusion, thrombolysis has an important role to play in the treatment of peripheral ischaemia. This may be alone, or in conjunction with surgery and angioplasty. An increasingly relevant use is demonstrated in helping to improve the success rate of invasive radiological intervention.

It is appreciated that this is a retrospective study of limited numbers. There is a great need for new, multicentre, prospective trials. This need is becoming greater as new techniques such as pulsed-spray thrombolysis and new thrombolytic agents become available.

References