EARLY 4-HOUR POST-ANGIOGRAPHY AMBULATION AS A FEASIBLE ALTERNATIVE TO ROUTINE 24-HOUR BEDCARE

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SYNOPSIS

A prospective study was performed to assess the feasibility of early ambulation (defined as 4-hour post-angiography) as a clinically safe alternative to routine 24-hour bedcare as practised in our institution.

Over a period of six months, 118 patients in various age groups and of either sex were randomly allocated to either early or routine bedcare. Patients who were non-ambulant or having bleeding diathesis, severe hypertension (180/110 mmHg) or other conditions that would cause possible complications were excluded from the study.

No major complication was encountered in any of the patients. Our data showed that the incidence of haematoma formation (1–5cm in size) was 29.6% in the early group and 28.1% in the routine group. This difference is statistically not significant ($P > 0.05$). 7 of the patients in the early group showed an increase in size of the haematoma after ambulation.

It is therefore, concluded that 4-hour post-angiography ambulation is a safe alternative to 24-hour bedcare.

SING MED J. 1988; 29:63–65

INTRODUCTION

Angiography, being an invasive radiological procedure, has always been carried out as an in-patient examination. This is because of the potential complications that are associated with this procedure.

The objective of this study is to assess the difference, if any, between early ambulation (defined as 4 hours after angiography) and the routine 24 hours of bedcare after angiography. If the study should show no difference between ambulating patients at 4 or 24 hours, angiography may then be performed on an out-patient basis. This would then help ease the already difficult bed situation in our institution.

SUBJECTS AND METHODS

For the purpose of this study of ambulatory patients, certain groups of patients were excluded:

1. Those who were severely hypertensive i.e with a systolic pressure of more than 180mmHg or a diastolic pressure of more than 110mmHg on the morning of the procedure.
2. All non-ambulant or comatose patients.
3. Patients who have a history of bleeding diathesis or who were on anti-coagulant therapy.
4. Patients who required a post-procedural compression time of more than 10 mins.

Having excluded the afore-mentioned patients, the sample population of 118 in-patients over 6 months were divided into different groups by sex and age namely 11-30, 31-50 and 51-70 years. The patients who fitted our criteria were then randomised to either the early or routine category.

Risk factors which may increase the incidence of post-angiography complications such as hypertension and obesity were noted. The various procedural factors that were considered included duration of angiography, number of punctures, single or double-wall puncture, number of catheter changes, size of catheters and the use of dilators.

All the examinations were performed according to standard technique using transfemoral catheterisation. Compression time was standardised to 10 mins.

At the end of the procedure the patients returned to their respective wards. Those in the early group were assessed twice: at 4 and 24 hours after the examination. They were instructed to resume normal non-strenuous activities after the first assessment. Those in the routine group were assessed only at the end of the 24 hours. During the reviews, the pulses in the lower limb were checked and the size of any hematoma at the arteriotomy site estimated. The patient was interviewed for any symptoms. Further observations by the ward staff such as additional compression or change of dressing was obtained.

RESULTS

There was no significant difference in overall complication rates between early or routine ambulation of patients after angiography. None of our patients developed any major vascular or neurological complications. The only complication that was encountered was local hematoma formation. The complication rates for the early and routine groups were 29.6% and 28.1% respectively. The range of maximum diameter of the hematoma for both groups was 1-5cms. The average diameter was also the same (2.5cms). [Table 1]

5 patients selected from the early group, when reviewed at 4 hours were found to have oozing from the arteriotomy site. Bedrest was reinforced on these patients. Despite not being ambulated, these patients developed hematoma. These 5 cases were therefore included in the routine group.

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TABLE 1
POST ANGIOGRAPHY HAEMATOMA

Group	HAEMATOMA		
	Number (%)	Range of Maximum Dia (cm)	Average Diameter (cm)
Early	16/54 (29.6)	1–5	2.5
Routine	18/64 (28.1)	1–5	2.5

TABLE 2
NO. OF HEMATOMAS IN AGE-SEX DISTRIBUTION

Age Group (Years)	No of Hematomas		Total No. of Hematoma (%)
	Male	Female	
11 – 30	3	6	9 (26%)
31 – 50	4	6	10 (29%)
51 – 70	8	7	15 (44%)
	15 (44%)	19 (56%)	34

TABLE 3
RISK FACTORS ASSOCIATED WITH HAEMATOMA

Risk Factors	No of Haematoma (%)
Hypertension	8/31 (25.8)
Obesity	4/21 (19.0)

TABLE 4
RELATIONSHIP BETWEEN HAEMATOMA FORMATION AND DURATION OF PROCEDURE

Duration of Angiography	No of Haematoma (%)
Less than 1 hour	28/101 (27.7)
More than 1 hour	6/17 (35.3)

Analysis of the 16 cases that developed hematoma in the early group showed that 7 of the hematomas increased in size following ambulation. The increase in their diameters between 4 and 24 hours review varied from 1-4cms. None of them had developed the hematoma immediately following the angiogram. Of the remaining 9 cases, a 3.0cm diameter hematoma developed in 1 of them immediately after the procedure. All 9 cases had hematoma when first reviewed after 4 hours of bedrest. No change was seen after 24 hours.

Out of the 34 patients who developed hematoma, 44% were male patients and 56% female patients. No statistically significant difference in the incidence of hematoma formation is seen between the sexes. (Table 2)

There appeared to be a rise in the incidence of hematoma formation with increase in age. Again this is statistically not significant (Table 2)

25.8% of the patients with hypertension developed hematoma. Out of the 21 patients who were obese, 4 subsequently developed hematoma. (Table 3)

Looking at the procedural factors, a longer time of procedure did not appear to contribute to hematoma formation. No significant difference was seen between the cases done within an hour or those that took longer. (Table 4)

TABLE 5
RELATIONSHIP BETWEEN HAEMATOMA FORMATION AND NUMBER OF PUNCTURES

No. of Punctures	No of Haematoma (%)
One	30/109 (27.5)
More than One	4/9 (44.4)

TABLE 6
TYPE OF PUNCTURE AND HAEMATOMA FORMATION

Type of Puncture	No of Haematoma (%)
Single Wall	28/94 (29.7)
Double Wall	6/24 (25.0)

TABLE 7
CHANGE OF CATHETER AND HAEMATOMA FORMATION

Change of Catheter	No of Haematoma (%)
Nil	29/99 (29.2)
One and More	5/19 (26.3)

TABLE 8
CATHETER SIZE AND HAEMATOMA FORMATION

Catheter Size	No of Haematoma (%)
French 5	3/15 (20.0)
French 6/6.5	18/74 (24.3)
French 7/7.5	13/39 (33.3)

Most of the examinations were performed with a single puncture of the femoral artery. Only a small number (nine patients) required more than one puncture. Although it appears that the percentage of hematoma formation with more than one puncture is higher (44.4% cf. 27.5%) this is statistically not significant.

No difference was found in hematoma formation between single and double-wall puncture, or when there was a change of catheter. (Tables 6 and 7)

Comparing the sizes of the catheters used, there appeared to be an increasing percentage of hematoma with larger catheters. Again this was found to be statistically not significant. (Table 8)

DISCUSSION

Local hematoma formation and bleeding have long been recognised and accepted as a frequent complication following transfemoral puncture. As to what degree of hematoma is considered significant to be classified as a hematoma varies with different angiographers. According to Halpern (1) in an analysis of complications in 1000 cases of percutaneous transfemoral angiography, no purpose could be served by categorising mild local ecchymosis and/or mild induration as a complication. Discrete extravasations of volumes estimated to be below 20mls of fluid were discounted in his report. His complication rate for significant hematoma/bleeding that did not require medical treatment was 1.2%. Using this standard, 6 (5%) of our patients had significant hematoma. These 6 cases were equally distributed in both categories.

TABLE 9
RELATIONSHIP BETWEEN INCIDENCE OF HAEMATOMA FORMATION AND NUMBER OF RISK FACTORS

No. of Factors Present	No of Patients With Haematoma (%)
Nil	8/40 (20%)
One	13/36 (36%)
Two	11/29 (38%)
Three and More (Maximum of 6)	2/13 (16%)

In another study by Christenson et al (2), insignificant hematoma, oozing and/or ecchymosis, referred to as post-angiographic blood loss, was estimated at less than 100mls. If this standard is used, all the hematomas in our series are considered insignificant. (His complication rate of insignificant hematoma was 22.25%)

It has long been taught that the use of large diameter catheters, prolonged examination, excessive catheter manipulation and changes, and hypertension all increase the risk of subsequent hemorrhage and hematoma formation following transfemoral arteriography (3).

Therefore we looked into a number of these factors to see if they could have contributed to the hematoma formation in our patients. These were hypertension, obesity, procedure time of more than an hour, more than one puncture, double wall punctures, use of large-bore catheters, changes of catheters and the use of dilators. These factors were found not to increase the incidence of hematoma formation significantly in our series. Even taking into consideration the absence or presence of one, two or three and more factors present together in a patient, no significant difference in the results was noted. (Table 9)

Recommendations regarding postangiographic care of femoral puncture site were reported by Lang (4) based on comparative complications. As a result of his investigations he recommended 24 hours bedrest. The justification in this lies in the reduction in the incidence of hematoma formation. In his report, 4–6 hours after arterial catheterization is recognised as the critical time during which complications arise. Christenson (2) in his report on postarteriographic care of the femoral puncture site recommended 4 hours of bedrest.

Outpatient angiography in a small hospital in Maine was started in 1971. After 4 years of experience, Giustra (5) reported that there was no increased incidence of complications between inpatient and outpatient groups. Since this first report in 1975, a number of reports have been published regarding its safety (6–9). Wolfel et al (6) in 11 years of their experience with 2029 out-patient arteriograms had only one case of bleeding after the patient returned home.

In a prospective study of 100 consecutive outpatient angiograms, Guy-Saint-Georges et al (8) demonstrated that the majority of patients could be sent home in 4 hours without risk. 6% required longer observation for hematoma formation, low blood pressure and unexplained abdominal pain.

In the past 3 years, a number of reports on outpatient conventional angiography, cardiac catheterization (9), transluminal angioplasty (10), interventional radiology (7) and intra-arterial DSA (11) and their safety have been published.

CONCLUSION

The data collected from our study shows that the incidence of hematoma formation for both early and routine ambulation after angiography is the same. It demonstrates that the majority of patients especially the younger age-group can be safely ambulated 4 hours after angiography. This is a safe alternative to the universally practised 24 hours of bed-care as the latter is associated with patient dissatisfaction and complaints of backache and urinary retention. Outpatients and their relatives can be given instructions to apply pressure over the puncture site if swelling or bleeding occurs and to return to the emergency department immediately. Further instructions regarding the symptoms of arterial occlusion such as pain, pallor, paraesthesia and paralysis should be explained.

By careful selection of patients, proper technique and patient education, outpatient angiography is a feasible procedure.

ACKNOWLEDGEMENT

We wish to thank the staff of Neuroradiology Department, Tan Tock Seng Hospital for their assistance in the selection, randomization and preparation of the patients; Dr Koay Lok Hin for his advice; Miss Norchahya for typing the manuscript and Mr Chia Hyong Gyee for the statistical analysis of the results.

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