



## Patient acceptance of a foot pump device used for thromboprophylaxis

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**Our study aimed to find out patients' opinion on a foot pump device used for thromboprophylaxis, as compared to subcutaneous low molecular weight heparin injections.**

**A survey of 43 consecutive patients undergoing hip and knee joint replacement was carried out at our hospital. Patients were assessed for pain and a questionnaire was used to gauge patients' attitudes towards the two thromboprophylactic measures.**

**There was no statistically significant difference in the level of discomfort as assessed on the visual analogue score, between two methods. An equal percentage of patients (74.4%) disagreed that either the foot pump or injection was painful ( $p = 1$ ). Though a larger percentage of patients (footpumps : 44.2%, injections : 27.9% ;  $p = 0.12$ ) would rather not use the foot pump, still 69.8% would be willing to keep on using these foot pumps at home for 4 weeks after discharge from the hospital. Eighty one percent were agreeable to foot pump use if they have another joint replacement later.**

**Overall, the foot pump was at least as well tolerated as subcutaneous low molecular weight heparin in the group studied. Its use as post discharge prophylaxis is also acceptable to the majority of our patients.**

**Keywords :** hip arthroplasty ; knee arthroplasty ; thromboprophylaxis ; foot pump ; patient acceptance.

### INTRODUCTION

The efficacy of pneumatic compression devices for thromboprophylaxis is well accepted (2, 5, 8, 10, 11, 13). Their wider acceptance by the orthopaedic

surgeons is frequently restricted by the perceived patient discomfort leading to the possible non-compliance. Very little work has been done to find out patient's own perception regarding the use of these devices and their willingness to use them in a prescribed prophylactic treatment regime. In this study we aimed to find out about patients' viewpoint regarding the use of a foot pump device (A-V Impulse Foot Pump®, Novamedix, Andover, Hampshire, UK) in comparison to subcutaneous injection of low molecular weight heparin, used for thromboprophylaxis.

### MATERIALS AND METHOD

The study was carried out at our hospital, from April 2003 to July 2003, after approval from the hospital clinical audit department. During this period, all arthroplasty patients received an A-V Impulse Foot Pump (Novamedix, Andover, Hampshire, UK) along with subcutaneous low molecular weight heparin dalteprin (Fragmin®, Pharmacia & Upjohn) injections, for thromboprophylaxis.

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All patients electively admitted in the unit for total hip or knee replacements were included in the study. Informed consent was taken. Exclusion criteria were inability to give consent and any condition which would exclude use of one of the two thromboprophylactic measures such as active gastrointestinal ulceration or painful foot conditions.

Foot pumps were applied to both feet, in the recovery room after the end of the operation. The pump cycle was set to be activated every 20 seconds to a pressure of 130 mmHg, for a period of one second, according to the manufacturer's recommendation. Foot pumps were used whenever the patient was not weight-bearing. Dalteprin injections were given once daily subcutaneously into the anterior abdominal wall using a 26 gauge needle, starting 12 hours before surgery and every 24 hours thereafter. Patients were counselled to inform ward nurses if they found either of the thromboprophylactic methods uncomfortable and wished to discontinue it. Both modes of treatment were discontinued on discharge from the ward.

At the time of discharge, patients were given a questionnaire to gauge their acceptance of and the attitudes towards the two thromboprophylactic measures (table I). Patients were asked to comment if they 'agree strongly', 'agree', 'neutral', 'disagree' or 'disagree strongly', to certain statements relating to their thromboprophylaxis method. They were also asked to mark on a linear 10 cm visual analogue scale (VAS) the level of comfort associated with the use of thromboprophylaxis method (score of 0 being most uncomfortable and 10 being most comfortable).

## RESULTS

Forty three consecutive eligible patients admitted for total hip and knee replacements were invited to participate in the study. The average age of the patients was 69.9 years (range : 36 to 85). The study population included 14 males and 29 females. Twenty seven patients had total knee replacements and 16 patients had total hip replacements performed ; one patient had bilateral knee replacements. The average hospital stay was 6.58 days (mode : 7 days). There was no case of symptomatic deep vein thrombosis or pulmonary embolism. No case of excess bleeding due to use of dalteprin was noted. Four patients complained of sore feet related to use of the foot pumps but only

two patients stopped using them (one at day 2 and other at day 3 following surgery).

The data were analysed using the Stata package. Within the group studied, the average VAS score for the foot pump was 6.3 and for the injection the average VAS score was 7.3. A t-test shows this difference was not statistically significant ( $p = 0.07$ ).

Patient response to questionnaire showed that :

1. equal numbers of patients (32.7%) disagreed that either the foot pump or injection was painful ( $p = 1$ ) ; 13.9% found foot pumps painful and 11.6% found injections painful, while the rest were neutral.
2. 44.18% agreed they would rather not use the foot pump, compared with 27.9% who would rather not have injections ( $p = 0.12$ ).
3. 51.2% would be willing to keep on using these foot pumps at home for 4 weeks after discharge from the hospital, while another 18.6% were neutral about it (overall 69.8%). This compared with 86% of patients who were agreeable or neutral to continual usage of injection ( $p = 0.07$ ).
4. 51% found foot pumps comfortable, while further 25.5% were neutral about them.
5. 84.8% agreed foot pumps restricted their mobility.
6. 53.5% found foot pumps soothing.
7. 27.9% said that foot pumps interfered with their sleep.
8. 44.2% preferred to have the foot pump on only during the daytime.
9. 37.2% preferred to have the foot pumps on only at night.
10. 27.9% preferred to have the foot pumps on during both day and night.
11. 72.1% agreed to use foot pumps if they were to have another hip or knee operation while 9.3% were neutral about it.

## DISCUSSION

Mechanical thromboprophylaxis has been proven to be an effective measure to reduce thromboembolic complications (2, 5, 8, 10, 11, 12, 13). There are no known significant adverse effects though

Table I. — Patients' response to the questionnaire

	Agree strongly	Agree	Neutral	Disagree	Disagree strongly
<i>Injections</i>					
I find the injections painful	0	5	6	22	10
I would rather not have these injections	1	5	6	21	10
I would be willing to continue these injections at home for 4 weeks after my discharge from hospital	5	28	4	4	2
<i>Pump use</i>					
I find the foot pumps painful	3	3	5	22	10
I would rather not use the foot pump	4	12	3	17	7
I would be willing to keep on using these foot pumps at home for 4 weeks after my discharge from the hospital	5	17	8	2	11
The foot pumps are comfortable	6	16	11	5	5
The foot pumps restrict my mobility	8	20	3	10	2
The foot pumps have a soothing effect	6	17	5	12	3
The foot pumps interfere with my sleep	6	6	4	21	6
I prefer to have the foot pump on only during the daytime	4	15	7	12	5
I prefer to have the foot pumps on only at night	3	13	6	14	7
I prefer to have the foot pumps on during the day and the night	2	10	12	13	6
If I had to have another hip or knee operation I would like to use the foot pumps	6	25	4	3	5

patient comfort is an issue. Several studies have commented on poor compliance with the use of mechanical thromboprophylaxis devices (1, 3, 4). This is especially important as studies suggest that rates of DVT may be linked to effective usage (7, 13). Studies have suggested that smaller devices like foot pumps would be more acceptable to patients as compared to bigger sequential compression devices (9).

Foot pumps work by simulating the effect of weight bearing on the foot venous plexus. There is a large venous plexus in association with the lateral plantar arteries in the sole of the foot (6). When the metatarsal arch is flattened on weight-bearing, this plexus is stretched, expressing about thirty millilitres of blood into the deep venous system of the lower limb. This bolus flushes the valve cusps where thrombi form, and it may enhance fibrinolysis (6). The A-V Impulse System foot pump® (Novamedix, Andover, United Kingdom) was

developed to reproduce this physiological mechanism in patients who are unable to bear weight. A cuff is held around the foot by a soft, non-expandable slipper with a hard sole between the heel and the metatarsal heads. The cuff is inflated every twenty seconds. This flattens the metatarsal arch, emptying the venous plexus and thus reproducing the effect of normal weight-bearing. Foot pumps have an added advantage of reducing postoperative drainage, oozing, bruising and swelling (11).

This study was designed to assess patient's perceptions and preferences regarding the use of thromboprophylaxis, in particular the use of foot pumps. Though we tried to ensure patient's compliance to use of the foot pumps but the study was not designed to test patient's compliance rates. Patient's pain response to 2 different thromboprophylaxis methods allowed us to develop an internal control in the group. Our study showed that a majority of patients was agreeable to the use of foot

pumps and would even be willing to continue their usage for extended periods at home. Foot pumps did not show any significantly greater pain response as compared to the injections. Although foot pumps restrict mobility (84.8%) and disturb sleep (27.9%), the majority (53.5%) still find them to be soothing. About 70% of patients were not averse to using these foot pumps for extended thromboprophylaxis and 81% were happy to use them again, if needed, for another joint replacement surgery.

A similar percentage of patients find injections (11.6%) and foot pumps (13.9%) painful but there is greater compliance with use of injections. We postulate this to be because regular administration of injections is enforced, as part of patient's prescribed treatment regime, through nurses. Foot pumps are not usually prescribed on a patient's drug chart and there is some voluntary aspect to their use. A formal prescription may create an incentive for nursing staff to enforce compliance. Also, foot pumps need to be repeatedly put on every time a patient comes back to bed after mobilising. This can create a physical barrier through inertia and lack of motivation on the part of the staff and/or patient.

Our survey suggests that patients would be willing to continue using these foot pumps. Perhaps better education on therapeutic benefits of these pumps would help to overcome this inertia of patients and the ward staff.

## CONCLUSION

The AV Impulse foot pump was at least as well tolerated as subcutaneous Dalteparin in the group studied. The perceived barriers to their use have not been borne out by this study. Their use as post discharge prophylaxis is also acceptable to the majority of our patients.

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