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A Comparison Between Two Different Prophylactic Doses of Unfractionated Heparin for Deep Venous Thrombosis Prevention in Laparoscopic Bariatric Surgery

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ABSTRACT

Background: Deep Venous Thrombosis (DVT) is a major risk of morbidity and mortality in morbid obese patients underwent bariatric surgery. There are some controversies in different kind of prophylactic strategies for DVT in laparoscopic bariatric surgeries. Unfractionated heparin (UFH) is an available and reversible anticoagulant used for DVT prophylaxis.

Objectives: This study aimed to compare clinical results of two different dosage regimes of unfractionated heparin for short term prophylaxis of DVT after bariatric surgery.

Patients and Methods: 139 patients with morbid obesity who underwent laparoscopic bariatric surgery (laparoscopic Roux-en-Y gastric bypass, sleeve gastrectomy, and laparoscopic gastric banding) were evaluated in two groups: group A received 5000 IU unfractionated heparin q12h and group B received the same dose but q8h (preliminary dose received before induction of anesthesia followed by 2 or 3 times daily). All patients were evaluated by physical examination and Doppler ultra sound for DVT before and 10 days after surgery.

Results: There was no statistically significant difference between two groups in venous thrombosis. No thrombotic events were observed before and after operations. There were no heparin induced thrombocytopenia and no meaningful difference between two groups in postoperative bleeding.

Conclusions: This study showed that in combination with non-pharmacologic methods for prevention of thromboembolic events, both regimes of UFH prophylaxis had similar clinical effects.

▸ *Implication for health policy/practice/research/medical education:*
This study shows that heparin prescription twice a day is as effective as 3 times daily and there is no need for more doses. Study of this article could be useful for Laparoscopic and Bariatric surgeon.

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1. Background

Venous Thromboembolism (VTE) is a major cause of morbidity and mortality in morbid obese patients underwent bariatric surgery (1). Fatal pulmonary emboli (PE) is a leading cause of post-operative death in morbid obese patients. The co-incidence of deep vein thrombosis

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(DVT) and PE following bariatric surgery is 2% (2). As the number of bariatric operations is rapidly growing, more persons are the at risk of complications of the surgery (3-5). Since diagnosis of venous thrombosis in severely obese patients due to difficulties of performing physical examination is challenging, preventing the patients from venous thromboembolism is crucial in postoperative management of bariatric surgery (6). Several prophylactic measures including unfractionated heparin, low-molecular weight heparin (LMWH), intermittent compression devices, elastic stockings, early ambulation, and Inferior Vena Cava (IVC) filters have been proposed to reduce high incidence of DVT in postoperative bariatric surgical patients (7, 8). Although all clinicians agree that prophylaxis is crucial, still there are some controversies over the best practice for prevention of DVT during laparoscopic surgery (2, 9). Based on SAGES (Surgical Association of Gastroenterologist Surgeon) guidelines the prophylactic therapy should be employed to the individual patient who is likely at the risk of VTE but there may be a specific procedure that has a variety of treatment strategies (10).

2. Objectives

The study aimed tocompare between clinical results of two different dosage regimes of unfractionated heparin for short term prophylaxis of deep venous thrombosis after bariatric surgery.

3. Patients and Methods

This study is a prospective randomized controlled trial (Irct ID: IRCT201008253384N3) performed on 139 patients who underwent laparoscopic bariatric surgery (gastric bypass, sleeve gastrectomy, gastric banding, or gastric plication). All patients were referred to obesity center of Rassool Akram hospital and were selected for laparoscopic bariatric surgery if BMI > 40 kg/m^2, or BMI > 35 kg/m^2 accompanied with comorbidities of diabetes, hypertension, sleep apnea, osteoarthritis, and other obesity induced diseases. Deep and superficial venous system of lower extremities was evaluated by physical examination and color doppler ultrasound before and 10 days after operation. Patients were randomly divided into two groups: group A administered by UFH/5000 IU SC q12h and group B by UFH/5000 IU SC q8h. All patients wore prophylactic compression stockings (below- knee elastic stockings, before and one month after operation) and were ambulated first day post operation. All operations were accomplished through similar technique by several surgeons on the same experience level. Since DVT develops more frequently within first 10 postoperative days we targeted this period for next evaluation. The results examined by Pearson Chi-Square test.

Exclusion criteria included patients with history of DVT and PE (Pulmonary Emboli), evidence of DVI (Deep Venous Insufficiency) in physical exam or Doppler, any bleeding tendency (in history and lab tests), or history of allergy to heparin. Ethical principles were considered in study.

4. Results

There were a total number of 139 patients randomly divided into two study groups: 68 patients (48.9%) in group A received 5000 IU unfractionated heparin subcutaneously q12h, and 71 patients (51.1%) in group B received 5000 IU in the same route q8h. All operations were performed laparoscopically as a primary bariatric surgery. 126 (90.6%) patients were female and 13 (9.4 %) patients were male. The mean age, weight, and BMI were 36.74 ± 9.5, 119.7 ± 20.3, and 44.29 ± 6.9, respectively without statistically significant difference between two groups *(Table 1)*. More than 72% (101 patients) underwent laparoscopic Roux-en-Y gastric bypass, while 35 patients (25.2%) experienced sleeve gastrectomy, 2 patients (1.4%) gastric banding, and one patient gastric plication (0.7%). Twenty one patients (15.1%) exhibited varicose veins in pre-operative physical examination. Doppler performed before surgery recognized saphenofemoral junction reflux in 2 patients. Mean operative time was 112.5 ± 35 without significant difference between two groups *(Table 2)*. There was no correlation between oral contraceptive pill (OCP), hypertension (HRT), or other drugs with post-operative DVT. No relation was found between histories of DVT in patients or their relatives, cardiovascular diseases, blood dyscrasia, or hypertension and post-operative DVT. (No patient had blood dyscrasia).

Group A patients were not statistically different from group B in physical exam and Doppler results before and 10 days after surgery. No DVT occurred on 10th day post operation in both groups (100% without DVT).

There were three cases of heparin discontinuation due to the bleeding, 2 patients (2.9%) in group A and one patient (1.4%) in group B with no significant difference between groups. Two patients (one in group A and one in group B) underwent reoperation because of hemody-

Table 1. Descriptive Statistics

	Patients, No. (%)	Minimum	Maximum	Mean ± SD
Age	139	17.00	68.00	36.7482 ± 9.56980
Weight	139	89.00	200.00	119.7158 ± 20.32829
Height	139	149.00	185.00	163.7698 ± 7.26174
BMI	139	32.00	80.12	44.2936 ± 6.89119

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Table 2. Demographic Data and Incidence of Deep Venous Thrombosis Between 2 Groups

	Patients, No. (%)	Valid Percent	Cumulative Percent
Gender			
Female	126 (90.6)	-	-
Male	13 (9.4)	-	-
Type of Operation			
Gastric Bypass	101 (72.7)	72.7	72.7
Gastric Sleeve	35 (25.2)	25.2	97.8
Gastric Banding	2 (1.4)	1.4	99.3
Plication	1 (0.7)	0.7	100.0
Total	139 (100.0)	100.0	
Physical Exam of Legs for DVT Before Surgery			
Normal	135 (97.1)	97.1	97.1
Evidence of DVT	1 (0.7)	0.7	97.8
DVI	3 (2.2)	2.2	100.0
Total	139 (100.0)	100.0	
Physical Exam of Legs for DVT After Surgery			
Normal	137 (98.6)	98.6	98.6
Evidence of DVT	1 (0.7)	0.7	99.3
DVI	1 (0.7)	0.7	100.0
Total	139 (100.0)	100.0	
Doppler Before Surgery			
Normal	138 (99.3)	99.3	99.3
DVI	1 (0.7)	0.7	100.0
Total	139 (100.0)	100.0	
Doppler After Surgery			
Normal	139 (100.0)	100.0	100.0

Abbreviations: DVI, Deep Venous Insufficiency; DVT, Deep Venous Thrombosis

namic instability and anemia and the another one was managed conservatively. The etiology of bleeding in re-operated patients was stapler line arterial hemorrhage which was controlled laparoscopically.

5. Discussion

Morbid obesity is a significant and rapidly growing problem in modern world. Severe obesity is attributed to numerous adverse effects that cause earlier death (11). For severely obese patients (BMI > 40 kg/m^2, or BMI > 35 kg/m^2 with associated comorbidity) who fail to achieve weight loss through other conservative treatments, bariatric surgery is a recommended treatment. Morbid obesity has been shown as a major independent risk factor for acute pulmonary emboli (12). Also bariatric surgery, in particular laparoscopic surgery, is a major intervention related to development of Postoperative venous thromboembolism and fatal PE (2, 9). Although Erickson *et al.* recommended thromboprophylaxis to all operated obese patients, Caprini and colleagues described multimodality risk reduction protocol based on each patient before surgery (5, 13). Wille-Jorgensen and Ott identified that the combination of compression stockings and low molecular weight heparin was more effective than either alone (14). F. Kalfarentzos and colleagues in a prospective study evaluated the effects of 2 different doses of nadroparin as DVT prophylaxis in 60 open bariatric surgery and the results indicated that the dose of 5700 IU (i.e. lower dose) once daily was effective, safe, well-tolerated, and therefore recommended for venous thromboembolism (2). In another survey, Scholten *et al.* studied 481 patients divided into 2 groups and underwent bariatric surgery and concluded that the use of higher dose of enoxaparin (40 mg q12h) was more effective in lowering DVT complications without any bleeding (9). We examined effects of two doses of unfractionated heparin for DVT prophylaxis in morbid obese patients underwent laparoscopic bariatric surgery. Unfractionated heparin is an available, reversible, and cost effective anticoagulant which is recommended for DVT prophylaxis. There was no need to check lab test for its efficacy (as X factor for LMWH).

This study shows that unfractionated heparin twice daily was as sufficient, safe, well tolerated, and convenient as three times per day for DVT prophylaxis in laparoscopic bariatric surgery. Although other studies showed total incidence of thromboembolism including subclinical cases is obviously much higher than clinical cases (5), in this study there was no statistically difference between

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results of physical examination and Doppler evaluation before and after surgery. Since early ambulation and compression stockings were employed in all patients, a multimodality strategy on prophylaxis of venous thrombosis should be considered. However, a comparison between non-pharmacological methods and heparin derivatives medication in DVT prophylaxis is suggested. This study shows that both regimes of UFH prophylaxis in combination with non-pharmacologic methods for prevention of thromboembolic events, have similar clinical effects.

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Authors' Contribution

First author and corresponding author contributed 100% and the other authors 50%.

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