

# How long should LMWH be used after sleeve gastrectomy?

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## INTRODUCTION AND OBJECTIVES

Obesity is a common and significant health problem in both developed and developing countries. Laparoscopic sleeve gastrectomy (SG) is one of the most popular techniques used for weight loss in various countries, including the USA. In recent years, LSG has become a popular procedure, and its resulting in weight loss and comorbidity resolution are similar to those of laparoscopic gastric bypass.<sup>1</sup> In the experimental study, which examined the relationship between obesity and venous thromboembolism (VTE), obesity has been shown to double the risk of deep venous thrombosis (DVT).

However, it has been reported that just obesity is not a risk factor and increases the risk of VTE especially in the presence of other concomitant risk factors.<sup>2</sup>

While there is no need for routine thromboprophylaxis except for early mobilization in patients undergoing laparoscopic intervention without additional risk factors, low molecular weight heparin (LMWH), low dose subcutaneous heparin (SH) or mechanical thromboprophylaxis should be performed in patients with additional risk of VTE undergoing laparoscopic intervention.<sup>3</sup>

The aim of the study was to investigate the effects of LMWH administration on VTE for 15 and 30 days on high fat diet (HFD) induced rats followed by sleeve gastrectomy for VTE prophylaxis.

## METHODS

In this study we used 40 adult male Wistar albino rats (120 g). Animals were obtained from the Kobay Animal Breeding and Experimental Research Laboratory. The experimental protocol was approved by the animal ethics committee of Kobay Company (Turkey). All animal experimentation described in the submitted poster was conducted in accord with accepted standards of animal care.

Rats were fed a high fat diet for 16 weeks to induce obesity. The rats were divided equally into 4 groups (n=10); group 1 (control group); group 2 (only sleeve group), group 3 (15 day LMWH group), and group 4 (30 day LMWH group) in which LMWH in increased therapeutic doses was subcutaneously administered for 15 and 30 days, respectively. 16 weeks after feeding, SG were performed on rats from group 2, 3, and 4 (Figure 1).

Doppler ultrasound (USG) was performed by using GE Logiq E9 USG (General Electric Company, Boston, USA, 2016) device to investigate thrombosis of inferior vena cava and iliac veins in all rats under anesthesia just before and 1 month after SG. GE 11L Linear Probe (GE, General Electric Company, Boston, USA, 2016) high resolution (3-11 MHz) probe was used for doppler USG procedure. The presence of thrombus was investigated in rats by performing doppler USG just before and 1 month after SG, respectively. Thus, the misdiagnosis of possible micro-thrombi was avoided in doppler USG rats at the same time. The ultrasound probe was placed directly on the veins, thus avoiding artifacts that could be caused by the skin before pre-sacrification under laparotomy (Figure 2).

Rats were sacrificed and vena cava and iliac veins were removed for histological examinations to determine the effects of LMWH on the formation of thrombus. Vena cava and iliac veins from each animal were fixed in formaldehyde for 72 hours immediately upon collection, dehydrated, and embedded in paraffin. Serial sections, 5 µm thick, were collected on slides and stained with hematoxylin and eosin (H&E). Specimens were evaluated under the light microscope.

## RESULTS

In the pre-sacrification examination, thrombus was observed in the iliac veins that completely filled the vein lumen, had no blood flow in the doppler and did not allow compression in the vein in 3 rats from group 2 in the acute-subacute process.

In addition, 4 rats from group 2 also had microthrombosis that was not detected before SG but was observed in the examination performed before sacrifice. Microthrombosis was observed in the iliac veins of 5 rats in group 3 before sacrifice. On the other hand, there was no thrombus on doppler USG in rats from other groups before SG and sacrifice.

Clear differences were observed among the groups. With the presence of the thrombus consist of three different blood cells components: red blood cells, fibrin/platelets and white blood cells. The accumulation of blood cells in the lumen of vena cava from group 2 demonstrating a stable mixed thrombus. The size of the thrombus was smaller in the lumen of vena cava following administration of LMWH to rats for 15 days and 30 days after sleeve gastrectomy. Furthermore, the both cell types decreased in concentration in the thrombus specimen from group 4 in comparison with group 3 and 2 (Figure 3).

Thrombus formation was clearly seen in the lumen of iliac vein of rats from group 2. Thrombus consist of large amount of red blood cells and white blood cells were variably interspersed in vascular lumen. Small thrombus was observed in the lumen of iliac vein of rats from group 3. There was no thrombus formation in the lumen of iliac vein from group 4 rats (Figure 4). The histological results indicated that the long term or 30 days using bemiparin after sleeve gastrectomy caused decreasing in the thrombus size.

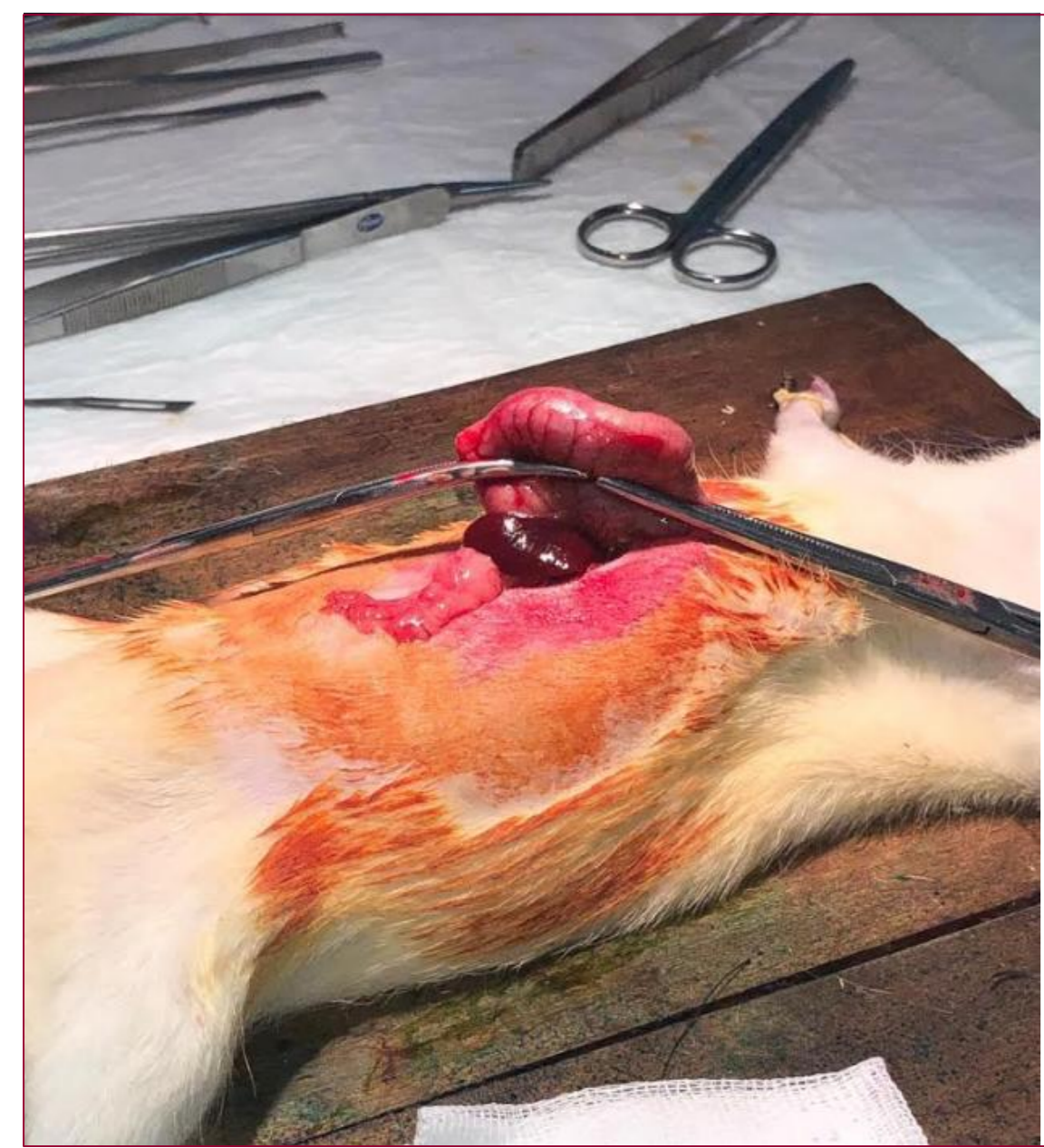


Fig. 1: Sleeve gastrectomy technique



Fig. 2: Doppler USG

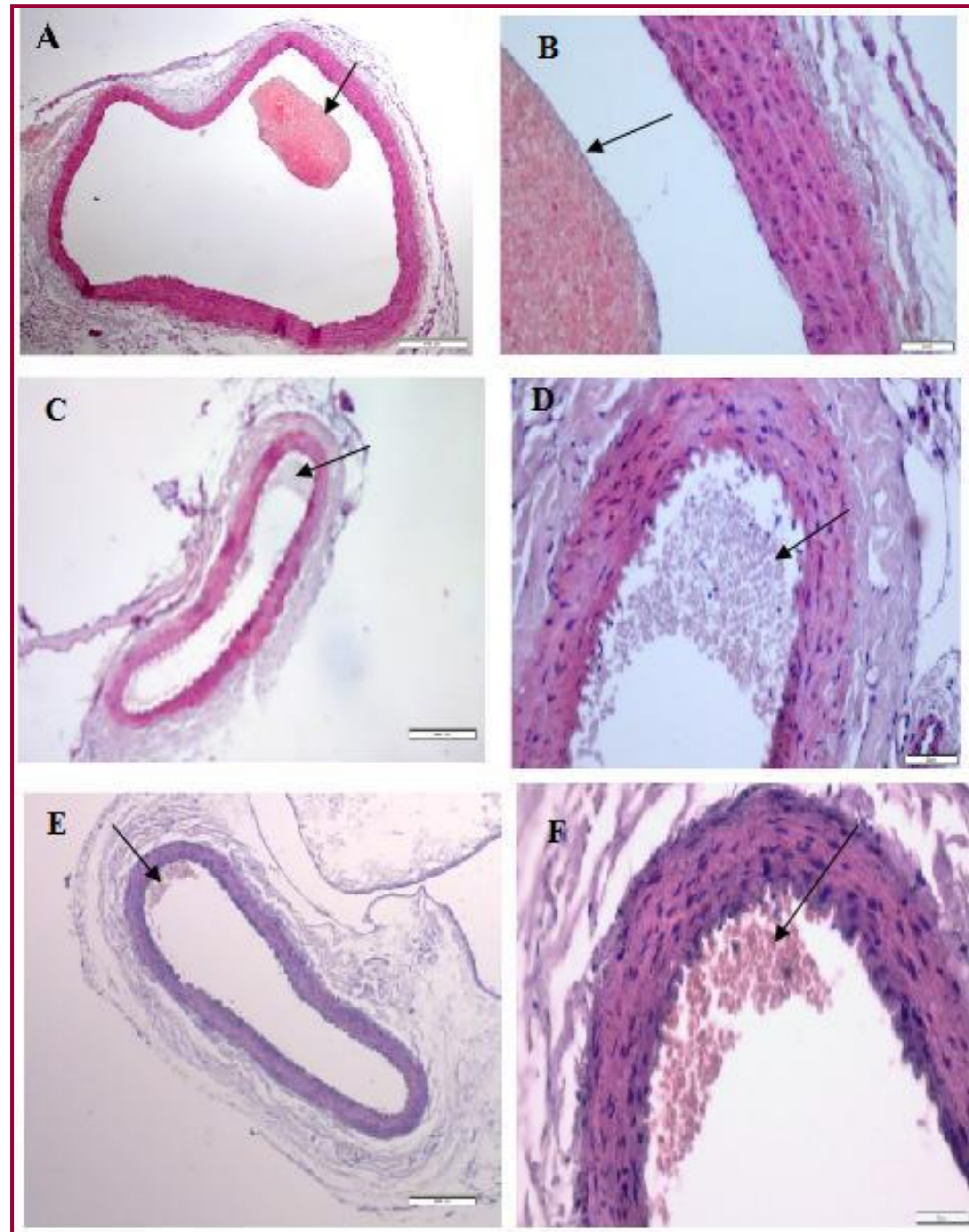


Fig. 3: Photomicrographs of the vena cava sections stained with H&E.

Group 1, the mixed thrombus (arrow) that composed of accumulation of blood cells were seen in the lumen of vena cava (A,B). Small thrombus (arrow) was present in the lumen of vena cava from group 2 and 3 (C,D). Scale bars of the left pictures of H&E 500 µm; scale bars of the right pictures represents 20 µm.

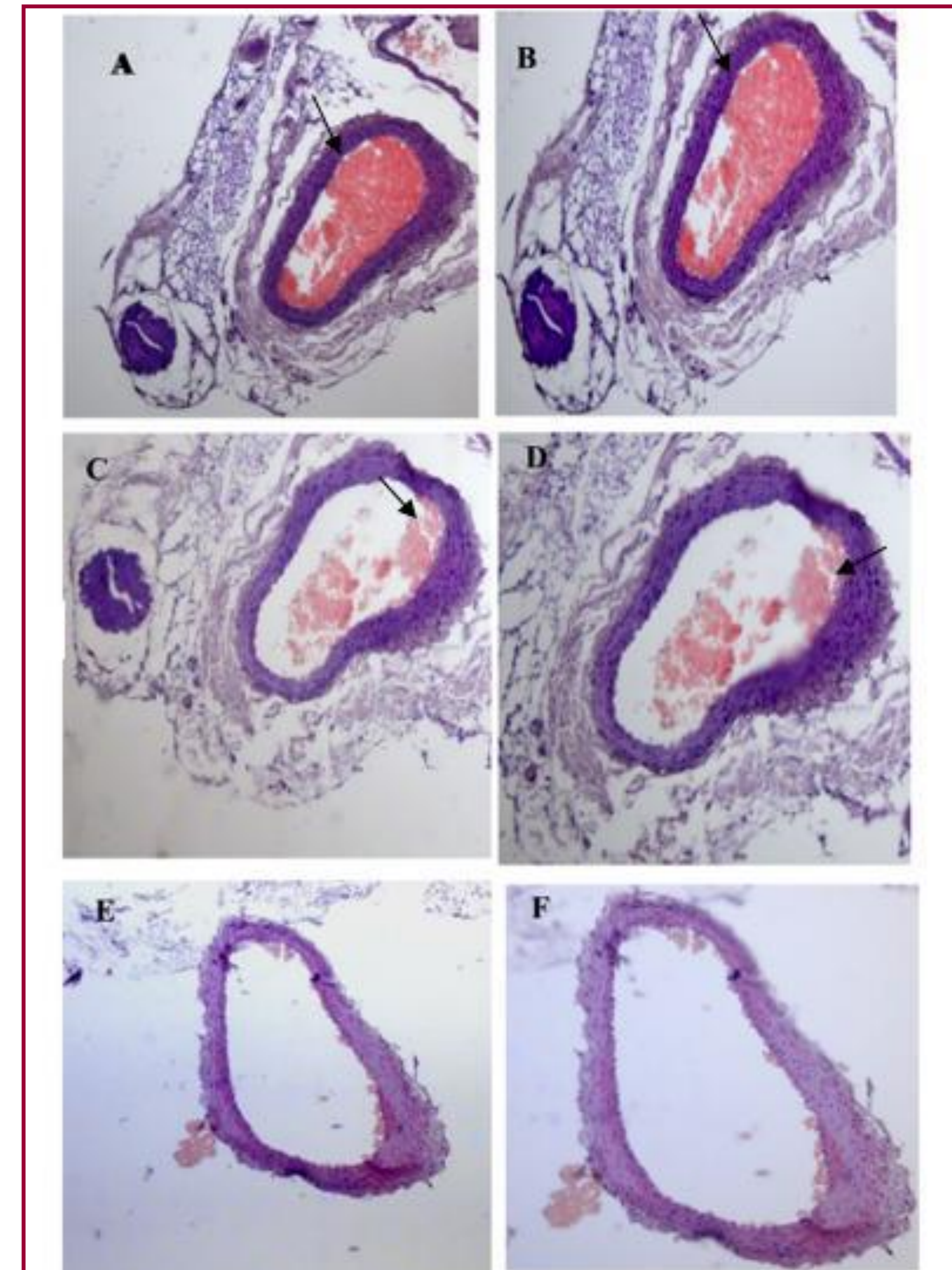


Figure 4: Photomicrographs of the iliac vein sections stained with H&E.

Thrombus (arrow) formation in the iliac vein lumen in the group 2. Well-organized thrombus consist of large amount of red blood cells and white blood cells are variably interspersed in vascular lumen (A,B). Small thrombus was present in the lumen of iliac vein from group 3 (C,D). No thrombus was observed in the lumen of iliac vein of rats from group 4 (E,F). Scale bars of the left pictures of H&E 500 µm; scale bars of the right pictures represents 200 µm.

## CONCLUSIONS

The histological and radiological results indicated that the long term or 30 days treatment with increased therapeutic LMWH doses after sleeve gastrectomy caused decreasing in the thrombus size.

These results suggest that microthrombosis could be present in the deep veins even in patients who are clinically asymptomatic and without radiological findings after SG, and LMWH may be useful during for longer periods in terms of the risk of developing VTE.

## REFERENCES

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