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Prevalence of deep vein thrombosis in heparin prophylaxis patients in general surgery department

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Abstract

Introduction: One of the complications of surgery operation is deep vein thrombosis. Because of its dangerous side effects, it is important to prevent it. The purpose of this study was to determine the incidence of deep venous thrombosis in patients with DVT-associated risk factors

Methods: This cross-sectionalstudy was performed on 100 patients at high risk for probability of DVT incidence in accordance with the known risk factors of the attached checklist over one-year interval in the General Surgery Department of Imam Reza hospital. All patients underwent lower extremity bandages during operation and prophylaxis with 5,000 units of subcutaneous heparin every 8 hours after surgery. At day-3 after the operation, the Color Doppler Ultrasound of the lower extremity and the evaluation of Iliac and Femoral and Popliteal venous system in two sides (bilateral) were performed.Descriptive statistics were reported in this study.

Results: Incidence of DVT after surgery was evaluated in one hundred high-risk patients underwent heparin prophylaxis for one year. Both sides of lower extremity venous Duplex Scan was performed on the third day after surgery operation. Only one case with partial subclinical thrombosis of the right femoral vein was found. Meanwhile, heparin did not have any complications.

Conclusions: Although the study seems to require a larger sample size for more accurate evaluations, given the fact that all patients were considered to be at high risk for DVT, the final result for one-percent of DVT incidence in this statistic community can be extended to larger communities with further studies.

Keywords: Deep Vein Thrombosis, Doppler Sonography, Heparin, Prevalence, Surgery

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Introduction

One of the problems that most of the surgeons face, is the adjustment of homeostasis during and after the surgery. The prevention of deep vein thrombosis, especially in the lower extremities, is one of these, which is so important. Occasionally, after general surgeries up to 20% and after major orthopedic surgeries up to 70%, DVT is created (1).

One of the most serious complications of DVT is detachment of thrombosis and its embolization to vital organs including the heart and lungs, and the brain(which is not common unless they have a simultaneous right-to-left heart shunt), which has a very high mortality rate. Of course, this problem in patients without symptoms who despite the presence of DVT, continue their normal activities and not being treated, isstronger and more dangerous. In this patients with obvious risk factors, including obesity and old age, presence of malignancy and long-term laparoscopic surgery, are at higher risk for developing venous stasis and consequently DVT. On the other hand, in some patients, including laparoscopic surgeries, due to the nature of this type of surgical procedure, the hospitalization time for these patients is low and is rapidly return to normal activity, therefore resulted in a higher risk for the embolization of clots in asymptomatic cases and may be in case of failure to recognize and treatment in appropriate time, lead to death (2-4).

Some diagnostic methods for deep vein thrombosis include: Contrastive ultrasound, Color Doppler ultrasound and using MRA (5).

In those methods, the most non-invasive method for confirming the diagnosis of deep vein thrombosis is Doppler ultrasonography. In this method, an image from venous system and its blood flow velocity is obtained. Although the success rate of this method depends on the skill of the person performing it. Therefore, the present data show that Doppler ultrasonography can detect clots located between knees and iliac crest with a sensitivity and specificity of 90% (6-7).

Doppler ultrasound can make it easy to see the Iliac and femoral common veins and Popliteal. However, sometimes it is difficult to observe the veins of the shin. One of the disadvantages of ultrasound is that for Femoral vein examination in adductor canal, itis not reliable (8).

The MRA is also used to imaging the veins in addition to the arteries, and the sensitivity and specificity are more than 95%for detecting DVT. Images depend on the signal obtained from blood flow. In acute thrombosis, the signals are homogeneous. MRA has many benefits, but the method is expensive and not available everywhere (9).

Therefore, in our study, Doppler ultrasound that has high accuracy in DVT diagnosis was used and preferred to MRA in terms of access and economic costs.

Drug prevention for DVT is usually done with low dose heparin. Initially, a dose of 5,000 subcutaneous dose is injected 2 hours before surgery, and then continued every 12 hours for 6 days. This method provides a good preventive effect in most patients (1,10).

Considering the existenceof many risk factor for DVT incidence in patients and also the increasing tendency of surgeons and patients to carry out laparoscopic surgeries and increase the risk factors such as obesity and considering that venous stasis after surgery increased the prevalence of DVT in these patients and also increases the surgical complications (11), we aimed to evaluate the incidence of DVT with the help of Doppler sonography and also evaluate the preventive effect of heparin in order to prevent the complications of surgery for patients and at a wider level, help to promoting community health.

To reduce the incidence of complication caused by thromboembolic events following DVT, a rational solution is identifying high-risk patients based on patient's history, clinical examination and patients classification, so that it can start the appropriate prophylaxis with the aim of reaching to morbidity and mortality reduction timely. These prophylaxis procedures include the limb bandage before beginning the long-term surgical operations and even the beginning preoperative heparin in high-risk patients, and the most importantly, setting up patients and return back to the life as soon as

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possible after surgery (12).

The main purpose of this research is to investigate the incidence of DVT with the help of Doppler sonography in post-operative patients who underwent preventive treatment by subcutaneous heparin (according to the protocol of the department), which by survey through its results and performing further studies in the form of wider statistical societies can investigate the effect of heparin prophylaxis on the prevention of DVT in high risk patients. On the other hand, by analyzing the results of this study and comparing it with similar cases, it is possible to review the risk factors for the development of DVT in order to reduce the complications and mortality associated with deep vein thrombosis.

Materials and Methods

This cross sectional study was conducted in one year between 2017-2018 in the General Surgery Department of at Imam Reza Hospital, Mashhad, Iran. To conduct this study, all members of the patients' community who were included in the study underwent prophylaxis with post-operative heparin, and Color Doppler ultrasonography was used on the third day to detect DVT, as most common DVT occurs within 5 days after surgery (13).

One-hundred patients who were high risk for incidence of DVT, according to known RFs in attachment checklist, were recruited. In this study, patients diagnosed as high risk DVT incidence, underwent the lower extremity bandage during surgery and after surgery, according to the department protocol received prophylactic treatment with subcutaneous heparin of 5,000 units each 8 hours. Subsequently, patients underwent bilateral Doppler ultrasonography for lower extremity and survey of Iliac and Femoral and Popliteal vein on the third day after surgery. Finally, the prevalence of DVT with the patient-related RF and the type of surgery and other related risk factors were recorded in each patient's checklist. The checklist included risk factors 1, 2, 3, and 5 points and single point RF is a reference for women. The final score is calculated from the total risk factors and based on that, level of risk and risk of DVT incidence is determined and accordingly the patient is treated appropriately.

In this study, patients after surgery on the third day underwent exclusively diagnostic examination by duplex scan. The main variable and the main consequence of this study is the incidence of DVT after surgery despite using heparin, that for achieving to this goal, lower extremity Doppler ultrasonography was used.

Each week, 2 patients from the selected statistical group were examined. Overall in the period of one year, one hundred high risk patients for DVT incidence were enrolled in the study. Sampling was done randomly regardless of age and sex groupsamong high-risk patients.

In order to perform the Duplex scan, no costs were received from patients. In spite of the fact that the duplex scan is completely non-invasive and does not have any complications for the patients, the goal and advantages of doing it were explained to each patient,and informed consents were obtained from patients.

Categorical variables and the prevalenceof outcome variable were reported as frequency and percent. This study has approved by the ethical committee of Mashhad University of Medical Sciences (Reference number: IR.MUMS.fm.REC.1396.174).

Results

A total of 100 patients were 49 male and 51 female. The gender distribution was balanced, 49% male vs 51% female in the entire cohort of 100 patients. 12% of the statistical population included patients less than 40 years old and 49% were 40 to 59 years old and 33% were between 60-74 years old and about 6% were more than 75 years old. The mean age of patients was 47 years old (Table 1).

In investigating other risk factors, in addition to the age, the following findings can be considered:

11% of patients had a history of major abdominal surgery. In the study of BMI as an independent risk factor, 88% of patients with BMI less than 30, 5% had BMI between 30 and 50 and 7% of patients with BMI greater than 50. 94% of the patients in our statistical population had no lower extremity edema in examination. 6% had right lower extremity

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edema. 17% of patients had under treatment CHF which were started one month earlier. 2% of patients experienced MI over the past month. In 12% of the patients, lung function disturbances in the PFT and the history of under treatment COPD, were significant. 11% of women had OCP use history due to menstrual cycle disorders during the last few years. 2% of patients were completely bed ridden because of CVA. 3% of the patients had central vein catheter (jugular).

Table 1. Baseline patient characteristics

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Variable	Category	Frequency	Percent
Gender	Male	49	49%
	Female	51	51%
Age	< 40 years	12	12%
	40-59 years	49	49%
	60-74 years	33	33%
	> 75 years	6	6%
History of major abdominal surgery		11	11%
BMI	<30 kg/m^2	88	88%
	30-50 kg/m^2	5	5%
	>50 kg/m^2	7	7%
Right lower extremity edema	Present	6	6%
	Absent	94	94%

In the classification of the duration of the surgical procedure during the recent admission in 5% of the patients, the duration of the operation was less than one hour,in 25% between one to two hours, in 38% more than 2 to 3 hours and 32% of patients have had an operation longer than 3 hours. A total of 4% of the surgeries were laparoscopic and 96% were open surgery. 88% of the patients had cancer during the performing of study and had a history of chemotherapy in historiography. 2% of patients had pelvic bone fractures during the past month.

Discussion

Considering the importance and the role of known risk factors for deep vein thrombosis, especially in patients with postoperative surgery conditions, and the role of heparin in preventing clot formation and the complications of embolization of thrombosis, this study investigated the prevalence of DVT in post-operative conditions and in spite of receiving prophylactic treatment.

In this study, 100 patients were selected during a year period between 1395 and 1396 who were all high risk for DVT prevalence, and after surgery they initially treated by preventive treatment with 5,000 units of subcutaneous heparin every 8 hours. All patients underwent bandage during lower extremity surgery. The third day after operation, the bilateral Doppler ultrasound of the lower extremity was performed, so that even an asymptomatic DVT does not go away, because primary subclinical thrombosis can lead to embolism and heavily endangered the patient's life.

Eventually, in a total of 100 patients, only one case with partial thrombosis in the beginning of the right common femoral vein was seen, that the

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patient was asymptomatic. DVT prevalence was 1% in this study. During the hospitalization period, no complication of heparin was reported.

In a study by Dr. Andrew L Muledha and colleagues at the surgery department of Mulaga School of medicine in, 2013, as a descriptive and cross-sectional study entitled "deep venous thrombosis after major abdominal surgery in a Uganda hospital: a prospective study", 82 patients were evaluated after major abdominal surgery. The mean age of patients was 45 years with a male to female sex ratio of 1:6. Ultimately, despite receiving heparin prophylaxis, patients underwent Doppler scan on days 7 and 21 after the operation, the incidence of DVT in This study reported 5%, that was significantly higher than our study(6).

A similar study in 2015, titled "Evaluation of the incidence of DVT after Heart Transplantation surgery," was performed by Elboudwarej and colleagues and published in the Clin.Transplant journal on the same year. In this study, 1258 cases of heart transplant patients were evaluated. The DVT incidence was screened on the seventh day after operation surgery by performing a duplex scan. In 117 patients (9.3%), deep venous thrombosis was reported, which 1.9% of this cases resulted in PTE. This study shows that the type of surgery is a significant risk factor for DVT and its complications, therefore, heart transplant surgery require a more invasive plan for thromboprophylaxis(14).

In a study entitled "Detection & Prevention of postoperative DVT using Nadroparin among patients undergoing major abdominal operations in India, a randomized controlled trial" in 2010, 65 patients over 40 years of age were studied, with 34 patients in the interventiongroup, they were subjected to thromboprophylaxis with Nadroparin and 31 subjects in the control group. At the end, DVT was not observed in the prophylaxis group, but 2 patients in the control group were symptomatic of DVT(7).

Another study done by Tun and colleagues at the University of SAINS in Malaysia in 2004, entitled "The incidence of post-operative deep vein thrombosis in general surgical patients of hospital universitisainsMalaysia", and it was a prospective study. 45 patients after major abdominal surgery, while underwent thromboprophylaxis with heparin was included in the study. The mean age of patients was 54 years, and 75% of patients were classified as moderate to high risk for DVT incidence. A duplex scan was performed 2 weeks after surgery. Only a DVT incidence of 2.2% was reported (one case)(15).

Another study titled "Detection/exclusion of deep vein thrombosis (DVT) in post-operative patients using plasma D-Dimer assay" by Neeraj Kaul in the Vascular and General Surgery Department of the Jamma Government School of Medicine in 2008, was conducted, in which40 patients who underwent Major General Abdominal Surgery and all of them were classified as moderate to high risk for DVT incidence while they were under the thromboprophylaxis with heparin, they performed a duplex scan on the 7th and 10th day after surgery. In this study, the incidence of DVT was 12.5%, it means it was reported in 5 patients, which is much higher than our study(9).

In another study, which was performed as a meta-analysis in 2017, with study of 3 general surgical center entitled "DVT after abdominal surgery" by Dr. MeernChisthi, Information of 334 patients were collected. All of these patients were under major abdominal surgery, and received heparin prophylaxis. DVT incidence was evaluated in these patients with duplex scan, which was reported to be 1.19%, which has a specific relationship with our study(16).

In another similar study titled "Risk factor for DVT in surgical patient", conducted by Pop at the Department of Nupouca surgery in Romania, 196 patients who underwent general surgery andhad received thromboprophylaxis were followed up with Doppler sonography one month after surgery. DVT incidence was reported as 2% (in 4 cases)(17). In a study by Mr. Clonston HW et al titled "The incidence of pre and postoperative DVT in colorectal cancer surgery" which was a prospective study in 2016 and examined by 55 high-risk patients for incidence of DVT in 4 educational hospitals. Duplex scans before and 6 weeks after surgery was performed. DVT incidence was reported at a rate of

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6.3% despite receiving thromboprophylaxis with heparin(18).

In a similar study, entitled "Incidence and RF for VTE after laparoscopic surgery for colorectal cancer", published by Becattiniin the Journal of the Hematology Society of Europe in 2014" a total of 305 patients were examined. In the report of this study, it is mentioned the 2.1% of deep vein thrombosis incidence in open surgery according to the findings of previous studies that in contrast to the 17.7% of DVT incidence in this study, the importance and role of laparoscopic surgeries for the high incidence of DVT, can be found(19).

In another similar study, entitled "Incidence of DVT after major abdominal surgery", conducted by Adnan B.Mofti in the Department of Surgery, Sultan Khalid school of medicine in Riyadh, in a 2013 cross-sectional study, 103 patients, including 56 women and 47, were included in the study. The mean age of the patients was 60 years, that mainly underwent hepatobiliary and upper GI surgery. After surgery, patients underwent thromboprophylaxis with heparin. The second and seventh days after surgery Doppler scan was performed, finally,14 patients equaled 13.6% of patients were patients with DVT(20).

The barriers and problems involved in the implementation of this research were as follows. The lack of proper collaboration between some patients in performing Doppler was greatly addressed by justifying patients and full explaining the benefits of doing it as a non-side-effect diagnostic method. The lack of coordination and collaboration between departments to transfer the patients to the radiology department for Doppler was one of the main obstacles to achieving a wider statistical society. Extensive workload of surgical residents and surgical department personnel doing department daily affairs, which severely limits the possibility of more careful consideration of research activities, including the recent study. The high cost of performing a Duplex scan for one hundred patients, which, Fortunately, with the coordination of the Department of Radiology, this problem was also overcome(21).

Conclusion

In this study, which performed on 100 patients were high risk for DVT prevalence and given that only one case of patients with an asymptomatic partial thrombosis occurred (1% prevalence of deep venous thrombosis despite receiving thromboprophylaxy with heparin) and comparing with similar studies around the world, it can be concluded that the protocol for thromboprophylaxy in the Surgery Department of the Imam Reza Hospital has had a significant role in reducing the prevalence of DVT. However, it is also important that the reduction of the duration of surgery and early onset of patients after surgery and also reduction of hospitalization time Which is one of the principles of the therapeutic policies of the surgical department of Imam Reza Hospital, has a significant role to the low prevalence of deep venous thrombosis and its progression towards thromboembolic complications. Hence the findings of this study is in favor of reducing the risk of DVT by receiving thromboprophylaxy with heparin in general surgery department.

On the other hand, due to the fact that none of the patients has a complication due to the use of heparin, onecan use heparin prophylaxis without the concern with the common protocols in the department, which of course, further studies can be helpful, and better results can be obtained by examining a larger sample size.The small sample size of this study, as major study limitation, was mainly due to lack of coordination and cooperation within and between different units in addition to high cost of the procedure duplex scans.

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Conflicts of interest

The authors declare that they have no conflict of interest.

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