

## Research article

### Combined approach of perioperative antithromboembolic management in abdominal and thyroid surgery

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#### Abstract:

**Objective:** Venous thromboembolism (VTE) in the form of either pulmonary embolism (PE) or deep vein thrombosis (DVT) complicates major surgery not infrequently. We analyzed in this study superiority of combined approach of thromboprophylaxis compared to conventional nonpharmacological preventive sets.

**Methods:** We prescribed both pharmacological and non-pharmacological thromboprophylactic interventions for patients encountered thoracoabdominal surgery from 2013 to 2018 at clinic named after I.K.Akhunbaev of Bishkek city and Interregional United Clinical Hospital of Osh city. Demographic characteristics and clinical examination data were evaluated. Thrombogenic risk for every patient was assessed. Screening for detection of VTE was conducted in early postoperative period.

**Results:** Two hundred forty-six candidates of abdominal and thyroid surgery were divided into 2 groups according to patient preference for prevention modality: combined and non-pharmacological. In the early postoperative period, venous thrombosis of the lower extremities developed in 17 patients non-pharmacological group and 8 patients of combined interventions ( $p < 0.05$ ).

**Conclusion:** Timely commenced, combined non-drug and pharmacological preventive sets for thromboembolic complications during major surgery decreases the incidence of venous thromboembolic complications.

**Keywords:** venous thromboembolism, lower extremity veins, major surgery, thromboprophylaxis

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#### Introduction

Venous thromboembolism (VTE) includes two related conditions - deep venous thrombosis (DVT) and pulmonary embolism (PE). In 1856, Virchow demonstrated that 90% of all clinically significant emboli come from DVT occurring in the deep veins of the lower extremities. Pelvic veins, the inferior vena cava, and the upper extremities can be source of emboli (1). Prevention and treatment of postoperative lower extremity venous thrombosis bears great medical and social value due to its 27-30% prevalence and

association with development of serious sequel of DVT. In 2-10% cases, operated patients develop pulmonary thromboembolism (PTE) with 0.3-3.7% mortality rate (2).

Survived DVT usually courses with residual effects. Most of patients evolve post-thrombotic disease of affected extremity. The disease is manifested after 5-15 years of DVT involvement and is found in 25% of patients with calf venous thrombosis, 46% of patients with femoral and calf venous thrombosis and 90-98% of patients with iliofemoral thrombosis (2).

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One third of patients with post-thrombotic disease are mandatory to change their occupation or switch to disability (6).

Recurrence of disease emerges in 21-34% of DVT survived individuals, and causes such fatal complication as thromboembolism of main pulmonary artery and its branches in 15% of cases (3,7).

According to evidence, DVT was involved in 30% patients encountered to various interventions of abdominal and thoracic surgery. The data of postoperative DVT frequency is quite controversial (4, 5). If based only on clinical data it seems insignificant. However, DVT of lower extremities, which occurs after various surgical interventions, is characterized by asymptomatic course. Sometimes a fatal pulmonary embolism may emerge as the first and exclusive manifestation of thrombosis. This circumstance states the extremely high percentage of lifetime undiagnosed massive embolic complications. (3, 4).

We analyzed in this study superiority of combined approach of thromboprophylaxis compared to conventional nonpharmacological preventive sets.

**Methods**

**Patients**

This was clinical, prospective, double-center study. We analyzed 246 patients who visited clinic named after I.K.Akhunbaev and Osh United Interregional Hospital and hospitalized for abdominal and thyroid surgery between 2013 and 2018. Their age range was 20-76 years. Total number of males was 78, females-168. This study protocol was approved by the Institutional Board of both hospitals and patients provided their informed consent for all procedures.

**Clinical examination and investigations**

All patients were clinically examined and investigated by routine laboratory and instrumental tests. In case of significant comorbidities, consultations of corresponding specialists were provided.

**Thrombogenic risk assessment**

We developed the thrombogenic risk stratification tool (Table 1) and evaluated thrombogenic risk as low, moderate and high in accordance with following parameters: weight, age, estimated operation time and presence of comorbidities.

Criteria	Low	Moderate	High
Weight	< 80kg	80-100kg	>100kg
Age	<40 years	40-60 years	>60 years
Duration of operation	<1 hour	1-3 hours	>3 hours
Comorbidities	-	-Essential hypertension, -Diabetes mellitus, - Respiratory disorders	-Coronary heart disease; -Acute cerebrovascular events; -Lower limb varicose veins, DVT; -PE in anamnesis -Malignancies

DVT – deep venous thrombosis, PE – pulmonary embolism

**Preventive management strategies**

All 246 candidates of abdominal and thyroid surgery were divided into two groups on the basis of patient preference for antithrombotic preventive tactics. The first group consisted of 126 patients (51.2%) who underwent a set of pharmacological and non-pharmacological preventive measures of thromboembolic complications in the preoperative period and continued at all stages of surgical treatment, until the day of discharge from the hospital (group of combined intervention). Pharmacological prophylactics included heparins of varying molecular weights: unfractionated heparin 10,000 IU, enoxaparin natrii 40 mg (4000 IU), nadroparin calcii (Fraxiparin) 0.3 ml 2 hours before surgery. In the main group with a low degree of risk, we prescribed an elastic massage. For this purpose, patients used elastic bandage overlaying and wearing elastic stockings. They provided maximum compression of the legs at the level of the ankles with a gradual decrease in the proximal direction. The second group consisted of 120 patients (48.8%) to whom the prevention of pulmonary embolism was carried out according to the traditional scheme (non-drug group). Conventional preventive measures

included earlier weaning from postoperative immobilization and elastic compression of lower limbs. Early mobilization was achieved in accordance with type and extent of surgery. The extent of preventive measures and pharmacological treatment in each group, depending on the degree of thrombogenic risk was different.

**Statistical analysis**

All statistical analyses were made by using MS Excel 2010. We evaluated impact of thrombogenic risk to venous complications and compared incidence of thromboembolic complications in both groups. For this aim Chi-square test was calculated.

**Results**

**Patient characteristics**

The median age of the 246 patients was 42 years (range 20-76 years). Most of the patients were in younger and working age. Female gender prevailed: 168 female patients (68.3%) to 78 male patients(31.7%). Patient distribution according to age and gender is presented in Table 2.

Table 2. Distribution of patients by age and sex

Sex	Total number of patients		Age distribution, years						
	N	%	≤20	21-30	31-40	41-50	51-60	61-70	≥71
Male	78	31.7	-	1	3	46	26	1	1
Female	168	68.3	1	6	18	67	62	11	3
Total	246	100.0	1	7	21	113	88	12	4
			0.4	2.9	8.6	45.9	35.8	4.8	1.6

**Clinical profile**

The vast majority of patients of both groups were candidates for biliary surgery: 95 (75.4%) patients diagnosed with chronic calculous cholecystitis and 12 (9.5%) patients with acute calculous cholecystitis in

group of combined interventions and 83 (69.2%) with chronic calculous cholecystitis and 14 patients with acute calculous cholecystitis in non-drug group. Patient characteristics according to surgical pathology are given in Table 3.

Table 3. Characteristics of patients by pathology				
Pathology	Groups			
	Main		Control	
	N	%	N	%
Stomach and duodenal disorders	2	1.6	3	2.5
Hepatic echinococcosis	4	3.2	3	2.5
Acute calculous cholecystitis	12	9.5	14	11.7
Chronic calculous cholecystitis	95	75.4	83	69.2
Abdominal hernia	3		5	4.2
Thyroid disorders	6	4.8	4	3.2
Hepatic neoplasms	4	3.2	3	2.5
Acute intestinal obstruction	-		5	4.2
Total	126	100	120	100

Eighty-nine (36.1%) of 246 patients had comorbidities requiring specialist consultations and thorough preoperative management.

**Thrombogenic risk and thrombotic complications**

Among patients, 47 (19.1%) had high-risk, 70 (28.9%) had moderate-risk and 129 (52.4%) had low-risk of thrombosis. The level of thrombotic risk was higher in main group (group of combined intervention). Table 4. highlights thrombogenic risk level in each group.

Table 4. Thrombogenic risk level				
Groups	N	Risk level		
		Low	Moderate	High
Main	126	59	39	28
Control	120	70	31	19
Total:	246	129 (52.4%)	70 (28.5%)	47 (19.1%)

We detected development of acute deep vein thrombosis of lower limbs in 8 (6.3%) patients of main group, while it was observed in 17 (14.2%) patients of control group, being significantly higher in control group (Chi-square=4.11, p=0.042). In main group, thrombosis developed following cholecystectomies (4), thyroidectomies (2) and hepatic resections (2). In control group, thrombosis was observed after cholecystectomies (12), thyroidectomies (2) and in mesenteric resections for strangulated hernias (3). Thrombotic 8 patients of main group distributed by this case: 3 patients developed thrombosis of the tibial veins, 2 of them had popliteal and 2 of them had superficial femoral vein thrombosis. The 17 patients of control group: 12 patients had tibial vein thrombosis 3 had popliteal and 2 had superficial femoral vein thrombosis. Only one of the operated patients had complaints of pain in the affected limb. All these patients were in advanced age (from 65 to 70 years), had comorbidities (coronary heart disease, hypertension and peptic ulcer and duodenal ulcer). Three of them were belonged to moderate risk, two to high risk groups. According to emergency indications, 6 patients were operated urgently, 6 - in a planned manner. All surgical interventions were performed under endotracheal anesthesia. The average duration of the operation was 134 minutes.

During 4 years of study in the early postoperative period, deep vein thrombosis was established in 6 patients (all from the high thrombogenic risk group), 9 patients had thrombosis of the superficial veins of lower extremities (patients belonged to the moderate and high risk group), in 2 patients ileofemoral thrombosis was combined with subcutaneous thrombosis (patients belonged to the group of moderate and high risk). The diagnosis of deep and superficial vein thrombosis was confirmed by ultrasound scanning of the venous system.

## Discussion

### *Main findings*

Our findings showed that 18% of operated patients with moderate and high risk of postoperative thromboembolic complications develop clinically significant deep vein thrombosis of lower extremities, and in most cases they were asymptomatic. In the main

group 4 cases of embologenic DVT were registered before the implementation of our prophylactic method. After the implementation combined pharmacologic and non-pharmacologic prophylactic measures patients from moderate and high risk groups did not develop PE in postop period. We demonstrated statistically significant low rate of DVT in group of combined prophylaxis as compared to non-drug only prophylaxis (p<0.05).

The nonspecific prophylactic measures achieved by physicians seemed to be ineffective. The obtained data clearly allows to recommend anticoagulant agents in such situations. We preferred fraxiparin 0.3 ml and enoxaparin 4000IU to acetylsalicylic acid; low-molecular weight heparins do not require clotting time measurement. These drugs are manufactured as ready syringes for single use which makes them more feasible in clinical practice. Unfractionated heparin in 10000IU daily dose also requires frequent aPTT assessment, but due to high effectiveness we preferred its use.

Our experience showed the feasibility of low molecular weight heparin prescription. Prophylactic use of enoxaparin 20mg 2 hours administered before surgery subcutaneously, reduced the incidence of postoperative venous thrombosis by 4 times compared with the group without anticoagulant prophylaxis and 2 times compared with patients who received unfractionated heparin. Of course, any pharmacological intervention for the patient bears side effects. It dictates thorough evaluation of benefit-risk ratio before applying any drug. In our case, we mention about bleeding complication of anticoagulant therapy. We had 2 cases of bleeding in prophylactic measure group when we used heparin 10000IU, and we decrease daily dose to 5000IU.

### *Thromboprophylaxis in major surgery*

Much more evidence-based studies have shown efficacy of pharmacological prophylaxis in patients who had undergone knee and hip arthroplasty and oncological diseases (6,7). But studies on pharmacological prophylaxis regarding to abdominal surgeries are not so frequent, yet most of them are retrospective descriptive studies which only shows prevalence of VTE (9).

Nonpharmacological preventive measures are directed to facilitate venous blood flow. Mechanical devices for thromboprophylaxis can be characterized as static or dynamic (8, 9). Static devices include compression stockings and placement of an inferior vena cava filter (an invasive procedure). Dynamic methods are represented by intermittent pneumatic compression devices and arteriovenous foot pumps.

#### **Limitations of the study**

Although our study has shown strong association of thrombotic complications with thrombogenic risk, we could not show exact factor which gives rise to such complications: whether this is age, gender or duration of operation etc. in next researches we will attempt to validate our thrombogenic risk criteria and we will conduct larger group investigations. And we could not statistically explain which antithrombotic agent played major role in decreasing the incidence of thrombotic complications.

#### **Conclusion**

Thus, to improve the results of surgical intervention for large abdominal operations, prevention of DVT and pulmonary embolism is of great importance. Timely initiated non-pharmacological and pharmacological treatment, prevention of thromboembolic complications during abdominal operations prevents the development of pulmonary embolism.

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