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SAFETY UPDATE OF THE INTERNATIONAL SOCIETY OF AESTHETIC PLASTIC SURGERY

PATIENT SAFETY UPDATE

DEEP VENOUS THROMBOSIS AND PULMONARY EMBOLISM: STRATIFICATION AND PROPHYLAXIS IN AESTHETIC SURGERY

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INTRODUCTION

The incidence of deep venous thrombosis is not negligible in aesthetic plastic surgery and can start from a deep vein thrombosis (DVT) and lead to a pulmonary thromboembolism (PE) as the most feared and lethal consequence. Its asymptomatic presentation has a high incidence and is difficult to diagnose clinically. In its symptomatic form, the incidence has been described in a range from one case in 10,000 young adults to one case in 100 older adults. Lethal thrombosis has an incidence of 0.8%. Findings in different autopsy studies demonstrate DVT and PE in individuals in whom the disease had not been suspected. However, stratification and prevention of DVT continue to be a matter of controversy [1–3].

The incidence of venous thromboembolism (VTE) among patients undergoing oncological head and neck surgery is 27.5%, among burned patients 23%, 4.2% in abdominoplasty patients, 1.32% in breast reconstruction surgery, and 0.59% in liposuction patients [3].

Up to 50% of DVTs begin in the intraoperative period; of the above, 50% can be resolved spontaneously in the next 72 hours. Thromboprophylaxis is believed to facilitate the lysis of clots and to prevent the buildup of new thromboses.

The risk of thromboembolism is very high in the first two weeks after surgery and remains high for approximately 2–3 months [5].

Approximately 25% of untreated leg thromboses may spread to the proximal veins within the first postoperative week. Similarly, the period of greatest risk for a fatal pulmonary embolism is 3–7 days after surgery and 10% will cause death within the first hour of the onset of symptoms.

Abdominoplasty is the procedure with a higher risk of DVT (0.34%). If combined with an intra-abdominal procedure, the risk increases to 2.17% and with belt lipectomy it is reported to be 3.4% [6].

STRATIFICATION – RISK PREDICTION IN AESTHETIC PLASTIC SURGERY

As long as there is no effective scale adapted to aesthetic plastic surgery patients, an existing classification may be used – including risk-modifying factors adapted for the specialty procedures, which will influence the rating of patients and the indication for prophylaxis. A recent consensus study reported that 79% of the participating

physicians considered that the available stratification methods were not enough for aesthetic surgery patients [7]. **However, a valid stratification scale (not available yet for aesthetic surgery patients) is needed** to give adequate prophylaxis.

So far, even though it has been criticized because of its methodology [2]**, the 2005 Caprini score remains the most widely utilized and validated risk prediction tool, and has previously been validated for use in plastic and reconstructive surgery inpatients** [8–13]. The American Society of Plastic Surgeons (ASPS) grants a **level of evidence II and a grade of recommendation B for the use of the Caprini 2005 index** in plastic surgery patients (even more reliable than the one proposed by Caprini himself in 2010, which overestimates the risk according to experts). Even so, the results of an individualized risk assessment should be interpreted with clinical judgment in the context of procedural risk [14]. Risk reduction strategies – such as cessation of hormonal replacement therapy or maintaining normothermia and other strategies to reduce prothrombotic factors, intraoperative compression therapy, surgery time, patient positioning and surgical procedures – are mandatory.

Based on the Caprini score, the risk of thromboembolism is negligible for scores 0–2, 0.6% for scores 3–4, 1.3% for scores 5–6 and 2.7% for scores >6 [13].

Completing the **Caprini 2005 format** (see Appendix 1) will provide a total score, which will indicate a clinical strategy. This form SHOULD be completed for hospitalized patients under general anesthesia.

The recommendations, according to the score obtained by the patient, apply to those who will undergo surgical procedures longer than 60 minutes, under general anesthesia, whatever the situation: body contouring surgery, abdominoplasty, breast reconstruction, lower limb procedures and procedures related to head and neck cancer.

Very recently [14], a new scale has been proposed by members of the Mexican Association of Plastic, Aesthetic and Reconstructive Surgery (AMCPER) to be specifically used in aesthetic surgery. They compared it with the Caprini scale, which is the gold standard. The effectiveness was retrospectively evaluated in 124 patients (16 had developed thrombosis and 108 did not). With Caprini's scale, there were more patients in the low-risk group (0–4 points) with thrombosis than with higher risk. They described two scales, one stratified (see Appendix 2) and another simplified (see Appendix 3). The risk for thrombosis was very similar using both scales, with 37.5% of the risk for thrombosis for the mild-risk group and 62.5% for the high-risk group. The only difference was for the low-risk group, being 0% risk for the simplified scale and 25% for the stratified scale. The authors do not provide strategies for DVT prophylaxis based on the scale. This scale has to be yet validated in the clinical trials.

THROMBOPROPHYLAXIS METHODS

Mechanical Thromboprophylaxis

Early ambulation is the first measure to do in all patients and, along with mechanical compression, are generally appropriate for patients at low risk [13]. The most basic, and known to all of us, are the infrapatellar graduated compression stockings. They have shown a 65% reduction in DVT since they increase venous return, improve valve function, and decrease the dilatation of the vascular wall.

Intermittent pneumatic compression (IPC) devices work by decreasing venous stasis by actively pumping the blood and stimulating fibrinolytic activity in the veins by reducing plasminogen activator one and increasing the release of tissue plasminogen activator. **They provide a 60% reduction in the risk of DVT.**

Heparins

Low molecular weight heparin (e.g., enoxaparin) and low-dose unfractionated heparin are the most widely used methods for preventing DVT/PE. Its effectiveness is proven. Both inactivate factors Xa and IIa (thrombin) of the coagulation cascade.

The advantages of low molecular weight heparin are: its lower binding to plasma proteins, which improves its bioavailability, requires a smaller number of daily doses and does not need studies for monitoring or dose adjustment (which is very useful and safe for both patient and physician), has a lower incidence of bleeding and bruising compared to low-dose unfractionated heparin. Low molecular weight heparin reduces the risk of DVT/PE by 70%.

Low-dose unfractionated heparin reduces the incidence of fatal pulmonary embolism by 47%, non-fatal PE by 41%, and causes a 57% increase in the incidence of non-fatal major bleeding [13].

For low molecular weight heparin, the ideal dosage would be based on the weight [9]. However, this can be very difficult to follow in our clinical practice.

In its guidelines, the ASPS mentions that the usual dose of enoxaparin is between 30 and 60mg daily. The most common presentations in our environment are 40mg, to be used subcutaneously once a day, but there is evidence that this could be not enough for prophylaxis and **no high-quality studies are currently available on the ideal duration of chemoprophylaxis in plastic surgery patients** [13].

Chemoprophylaxis benefits have to be outweighed against the risk of bleeding. There is no convincing data that preoperative heparin reduces VTE risk, but it is clear that there is a risk of bleeding with perioperative heparin in the general plastic surgery and orthopedic surgery literature. In the absence of firm data, starting prophylaxis postoperatively is almost certainly safer [14].

Pannucci et al. reported that thromboprophylaxis with enoxaparin (40mg subcutaneously every 24 hours or 30mg subcutaneously every 12 hours) in patients with a body mass index (BMI) > 40 kg/m^2, administered 6–8 hours after surgery, is not associated with an increase in the hematoma index requiring surgical revision. Independent predictors for reoperative hematoma were breast surgery, microsurgical reconstruction and postbariatric body contouring (Level of evidence: II) [15].

Ultrasound (Doppler Studies)

Doppler ultrasound can be used to detect clots and manage them appropriately, with or without mechanical compression or chemoprophylaxis [16].

THROMBOPROPHYLAXIS REGIMES IN PLASTIC SURGERY

There are no specific regimes for chemoprophylaxis in plastic surgery. There is no consensus about when to start or for how long.

The American College of Chest Physicians [13] suggests:

- No prophylaxis if the risk is very low <0.5% (Caprini 0).
- Mechanical prophylaxis (IPC) if the risk is around 1.5% (Caprini 1–2).
- If the risk is around 3% and no risk of bleeding, chemoprophylaxis (Caprini 3–4).
- If risk is around 6%, chemoprophylaxis + IPC (Caprini ≥5).

The latest recommendations in plastic surgery are to give chemoprophylaxis to inpatients with Caprini high scores (>7) [11], and even avoid surgery for patients with scores >8 [12].

Low and medium scores can benefit from mechanical measures only.

When to Start Its Administration

In **orthopedic surgery**, the initiation of pharmacological thromboprophylaxis **6 hours after surgery** has been shown to be effective and without the associated risk of major bleeding [17]. On the contrary, if it is administered preoperatively or less than 6 hours after surgery, it has been associated with major bleeding events without increasing antithrombotic effectiveness.

In **plastic surgery**, chemoprophylaxis could be started 12 hours after surgery [18].

How Long Chemoprophylaxis Should Last and What is the Risk of Major Bleeding

The risk of DVT remains high for at least 12 weeks after surgery [5].

In patients with a Caprini 2005 index >3, the use of chemoprophylaxis for a period of one week is effective without increasing the risk of bleeding (Level of evidence I).

In patients with a Caprini 2005 index >7, the extended use of chemoprophylaxis for a period of 4 weeks is recommended to obtain an effective reduction in the risk of DVT, without increasing the risk of hematoma or complications secondary to bleeding (Level of evidence I).

In the ASPS guidelines, it is mentioned that the use of postoperative chemoprophylaxis with low molecular weight heparin, unfractionated heparin or fondaparinux for a period of 1 week or up to 4 weeks in selected cases, does not significantly increase the risk of bleeding (Level of evidence: I). **However, this is not the generalized perception** [7].

CONTRAINDICATIONS FOR THROMBOPROPHYLAXIS

Seruya et al. [5] mention the important points to consider when using chemoprophylaxis and pneumatic compression devices.

For chemoprophylaxis, there are factors that increase the risk of bleeding so, in the presence of one of them, the use of mechanical methods and not the use of pharmacological methods should be considered.

Contraindications for chemoprophylaxis are the following:

1. Active bleeding
2. Patient presents with or has a history of induced thrombocytopenia by heparin
3. Platelet count less than 100,000/mm^3
4. Patient who is on oral anticoagulation or platelet inhibitors
5. Abnormal creatinine clearance.

The following factors should be considered to avoid the use of pneumatic compression:

1. Severe peripheral arterial disease
2. Congestive heart failure
3. Acute superficial and/or DVT.

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APPENDIX 1: PANNUCCI-CAPRINI STRATIFICATION SCORE

Date: _____

Patient´s name: _____

Age: _____

Diagnosis: _____

Procedure: _____ Anesthesia: _____

Table 1: Index for the Risk Stratification of Thromboembolism Caprini 2005

Each factor represents 1 point	
Age 41–60 yrs	
Minor surgery	
History of major surgery in the last month	
Varicose veins	
Intestinal inflammatory disease	
Swollen legs	
Obesity (BMI > 25)	
Acute myocardial infarction	
Congestive heart failure in the past month	
Sepsis in the last month	
Serious lung disease in the last month, including pneumonia	
Obstructive pulmonary disease	
Patient currently in bed	

Each factor represents 2 points	
Age 60–74 yrs	
Arthroscopic surgery	
Malignancies, actual or in the past	
Major surgery (>45 mins)	
Laparoscopic surgery (>45 mins)	
Patient in bed (>72 hrs)	
Splint for limbs in the last month	
Central venous catheter	

Each factor represents 3 points	
Age >75 yrs	
History of DVT/PE	
Familiar history of thrombosis	
Factor V Leiden	
Thrombin 20210A	
Increased serum homocisteine	
Lupus	
Anticardiolipine antibodies	
Heparin-induced thrombocitopenia	
Other thrombophilia	
(Which)	

Each factor represents 5 points	
Major arthroplasty, lower limb	
Hip, pelvis or leg fractures in the last month	
Vasculocerebral accident in the last month	
Multiple myeloma	
Acute spinal cord injury (paralysis) in the past month	

Only women (each factor represents 1 point)	
Oral anticonceptive or hormone replacement therapy	
Pregnancy or postpartum in the last month	
History of recurrent spontaneous abortions (≥3), premature delivery with toxemia, or infant with growth restriction	

Doctor`s name:

SCORE:

Table 1. From Pannucci CJ, Bailey SH, Dreszer G, et al. Validation of the Caprini Risk Assessment Model in Plastic and Reconstructive Surgery Patients. *J Am Coll Surg* 2011; 212(1): 105–112

APPENDIX 2

Table 2 Scale with factor stratification.

Propose score for plastic surgery patients	0 Point	1 Point	2 Points	3 Points	4 Points
1. Multiple procedures: breast augmentation or reduction, arm or leg lift, facelift, rhinoplasty, liposuction, fat injection, abdominoplasty, gluteoplasty	1 procedure	2 procedures	3 procedures	4 procedures	More than 4 procedures
2. Combination of procedures: hernia repair, hysterectomy, c-section, vaginal delivery	1 procedure	2 procedures	3 procedures	4 procedures	More than 4 procedures
3. Length of surgery	Less than 3 h	3-4 h	4-5 h	5-6 h	≥ More than 6 h
4. Fat that will be aspirated	no	Less than 1000 cc	1001-2000 cc	2001-3000 cc	More than 3000 cc
5. Fat that will be injected	no	Less than 100 cc	100-400 cc	401-800 cc	More than 800 cc
6. Age of the patient	Less than 40 years	41-50 years	51-60 years	61-70 years	≥ More than 70 years.
7. High-risk female patient: varicose vein, leg swelling, autoimmune disease, hormone replacement	Without past history	1 factor	2 factors	3 factors	4 factors
8. Surgical procedure performed on month before plastic surgery	Without past history	Removal cancer, central IV	Neuro, abdomen thorax surgery	Extensive burn injuries	Hip or knee surgery, radical oncological surgery
9. Body mass index (BMI)	BMI < 30	BMI 31-35	BMI 36-40	BMI 41-45	IMC > 45
10. Comorbidity: diabetes, high blood pressure, hearth diseases, lung diseases, cancer, AIDS, chemotherapy, stroke, smoking	Without past history	1 factor	2 factors	3 factors	4 factors
11. Recent trauma or fracture	No	Upper body	Multiple fractures	Hip or knee	Brain trauma, medullar trauma, palsy, burn injury
12. Personal or family history of deep vein thrombosis	No	1 family member	2 family members	3 family members	4 family members
13. Degree of mobility	Exercise often, running or walking	Daily activities, housekeeping, shopping	Limited mobility only activity at home	Long periods of time in bed or sitting, can walk	No movement, bedridden
14. Bed confinement after surgery	0-12 h	13-24 h	25-48 h	49-72 h	More than 72 h
15. Flight, travel by bus or car	No	Less than 4 h	4-5 h	5-6 h	More than 6 h
16. COVID-19	No pass history of infection	Infection three months ago with no complications or long disease	More than three months minor sequelae	Less than 3 months or moderated sequelae	Less than a month or important sequelae
17. Covid vaccine	No reaction no vaccinated	Vaccinated against Covid	Minor symptoms with vaccination	Leg swealing due vaccination	Thrombosis due vaccination
18. Elevation in blood tests: RBC, PT, PPT, INR, platelets, fibrinogen, C-reactive protein, D dimers	Without anomalies	1 factor	2 factors	3 factors	4 factors
19. Prophylaxis thrombosis: early deambulation, chemoprophylaxis, intermittent compression pneumatic prophylaxis, hydration	4 points of care	3 points of care	2 points of care	1 point of care	None point of care

Appendix 2. From Cuenca-Pardo J, Ramos-Gallardo G, Morales-Olivera M, et al. How to Stratify the Risk of Thrombosis for Aesthetic Plastic Surgery? The Proposal of a New Scale. *J Plast Reconst Surg* 2023; 83: 361–372

Low risk: 1–5 points; Moderate risk: 6–17 points; High risk: ≥18

APPENDIX 3

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Table 3 Simplified scale.

Score simplified for thrombosis plastic surgery	No	Yes
1. High-risk procedures: abdominoplasty, liposuction, fat graft to the gluteus		
2. Multiple procedures: breast augmentation, reduction, arm or leg lift, facelift, rhinoplasty, gluteoplasty, liposuction, fat injection to the gluteus, abdominoplasty		
3. Combined procedures as hernioplasty, hysterectomy, c-section, vaginal delivery		
4. Length of surgery more than 3 h		
5. Bleeding more than 500 cc		
6. Liposuction will be performed		
7. Fat will be injected		
8. Age older than 50 years		
9. Female patient with one of the following: varicose veins, leg swealing, auto immune disease, childbirth, hormone intake or contraceptive pills		
10. Surgery in the last month		
11. BMI greater than 30		
12. One of the following conditions: diabetes, high blood pressure, hearth diseases, lung diseases, cancer, AIDS, chemotherapy, stroke, smoking		
13. Any recent bone fracture, brain trauma, or burn injury		
14. Family or personal history of thrombosis		
15. Has a low degree of mobility		
16. In bed more than 3 days		
17. Have you traveled by plane or by bus or car for more than 4 h?		
18. Have you had COVID in the past 2 months?		
19. Has the patient been vaccinated for COVID in the past 2 months?		
20. Elevation in blood test: RBC, PT, PPT, INR, platelets, fibrinogen, C-reactive protein, D dimers		
21. Measures to prevent thrombosis: Yes (0 point) No (1 point)		
Total points		

Appendix 3. From Cuenca-Pardo J, Ramos-Gallardo G, Morales-Olivera M, et al. How to Stratify the Risk of Thrombosis for Aesthetic Plastic Surgery? The Proposal of a New Scale. *J Plast Reconst Surg* 2023; 83: 361–372

Low risk: 1–3 points; Moderate risk: 3–6 points; High risk: ≥7

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