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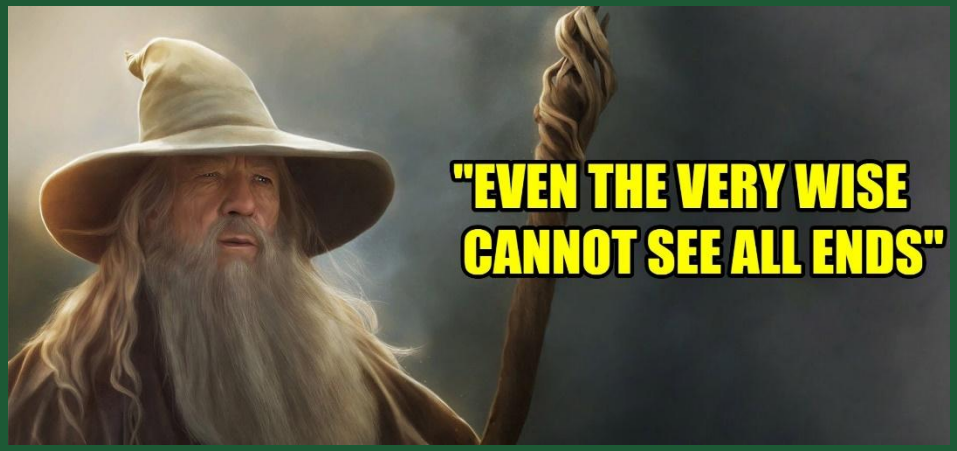
VTE Prophylaxis after Total Joint Arthroplasty Review



Elie Ghanem, MD

Background

- Venous thromboembolic disease (VTE) is one of the most common life-threatening complications after TJA and is responsible for readmission in approximately 1.7% of cases in the 90 days following operation.

- Fatal PE occurs in 0.1 to 0.2% of TJAs, accounting for more than 1,000 deaths each year in the US.

Background

- Many VTE events present early or in a delayed fashion, as long ***as 6 to 12 weeks*** after hospital discharge.

- The three-month cumulative prevalence of symptomatic VTE and pulmonary embolism after ***THA is 2.5-3.4% and 1.1%,*** respectively, compared with ***1.8-2.4% and 0.8%*** after **TKA**.

- Regardless of the cause, VTE has become a more visible complication following TKA than THA in the recent decade

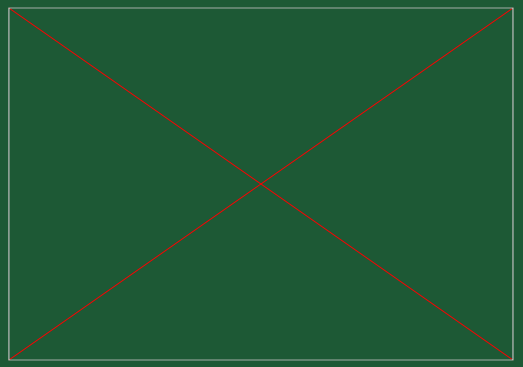
Background

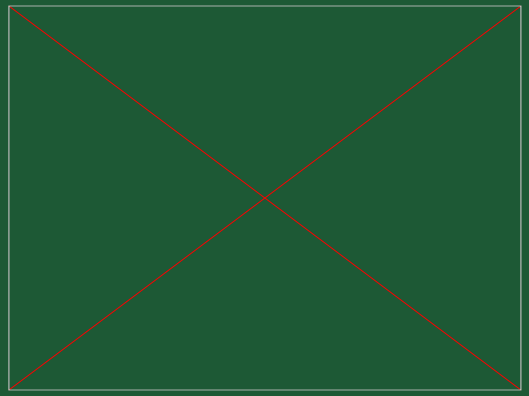
- The Goal:
  1) Prevent fatal PE and symptomatic VTE

  2) Reduce complications
     1) Bleeding
     2) Infections
     3) Return to OR

  3) Identify high risk patients and treat appropriately when needed.

Injectable Anticoagulants





- **Agents**
  - Heparin (LMWH)
  - Enoxaparin (Lovenox)
  - Fondaparinux (Arixtra)
- **Pros:** No monitoring
- **Cons**
  - Daily subcutaneous injections
  - Contraindications: renally dosed, contraindicated in dialysis patients

Warfarin (Coumadin)

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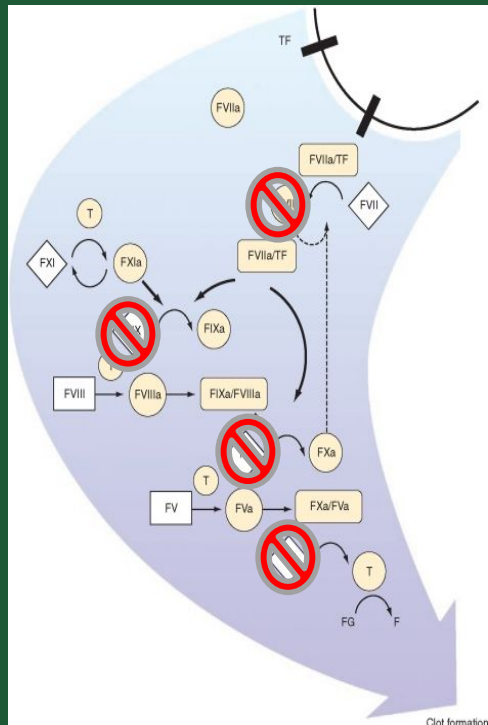
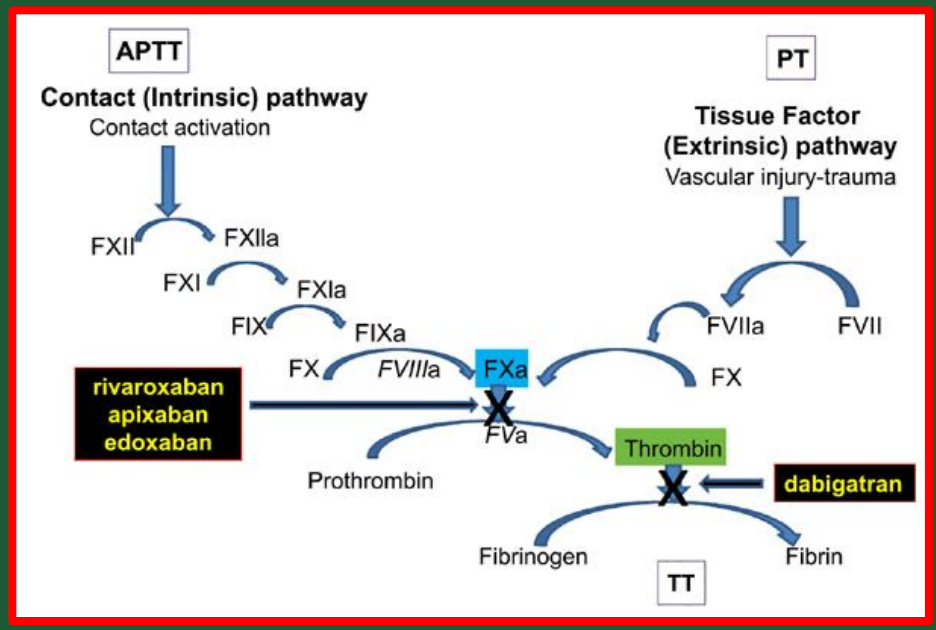
- Method of Administration: oral
- Monitoring: blood draws (INR, initially daily, frequency decreases to twice a week)
- Cost: low
- Mechanism of action: prevents recycling of vitamin K in the production of clotting factors in the liver
- Contraindications: many drug and food interactions



Direct Oral Anticoagulants

- **Agents**
  - Rivaroxaban (Xarelto)
  - Apixaban (Eliquis)
- **Pros:** No injection needed,
  No monitoring needed
- **Cons**
  - Cost
  - Reversal agents:
    - Factor VIII inhibitor bypassing activity (FEIBA)
    - Prothrombin complex concentrates (PCC)
    - Reverse factor 7a (rFVIIa)
    - Andexanet alfa (FDA approved)



Aspirin

- Method of Administration: oral
- Monitoring: none
- Cost: lowest
- Mechanism of action: inhibits platelet generation of thromboxane A2
- Contraindications: GI bleeding, allergies, kidney function

DVT prophylaxis in Total Joint Arthroplasty

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- **ACCP 2008**
  - Goal
    - Decrease DVTs
  - Level 1A recs
    - Start
      - LMWH 12-24 hrs
      - Arixtra 6-24 hrs
      - Coumadin POD 0
    - Duration
      - At least 10 days
      - For THA – up to 35 days
    - No ASA or heparin 5000U SQ as only means
    - No Duplexes if asymptomatic

- **AAOS 2007**
  - Goals
    - Decrease symptomatic PE
    - Minimize bleeding and wound complications
  - Recommendations
    - No Level IA recs
    - IIIB recommendations

PE risk	Bleeding risk	Anticoagulation
Standard	Standard	ASA, LMWH, coumadin, arixtra
High	Standard	LMWH, coumadin, arixtra
Standard	High	ASA, coumadin, non-pharmacologic
High	High	ASA, coumadin, non-pharmacologic

ACCP versus AAOS guidelines

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Table 1—*Comparison of the Methods Used by the ACCP and the AAOS Panels for Prevention of VTE in Patients Undergoing Elective Hip or Knee Surgery*

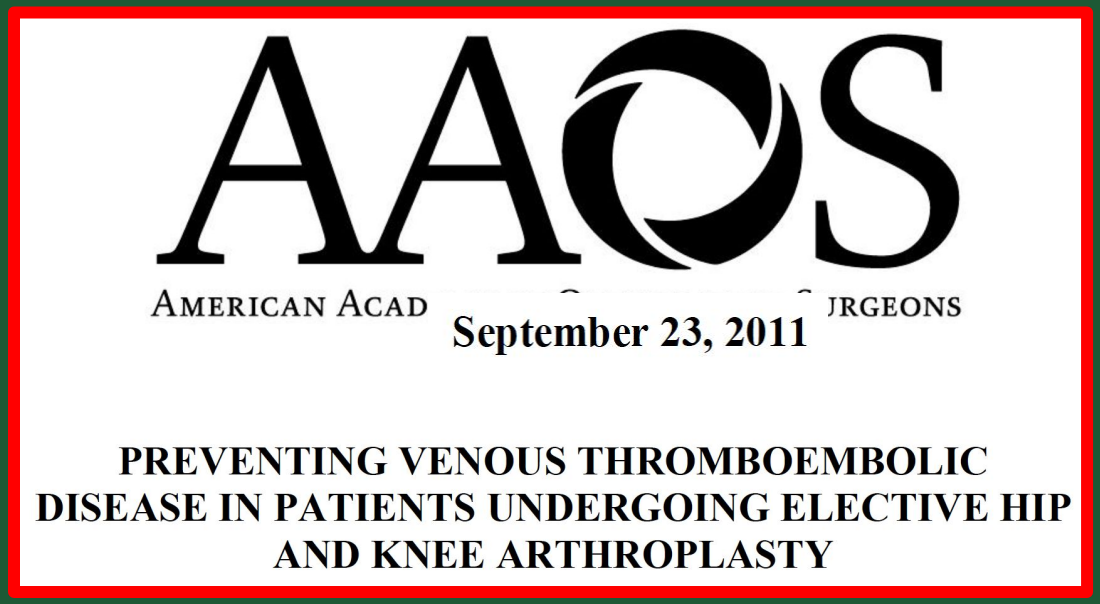
	ACCP[2]	AAOS*[3,4]
Year of publication	No restriction	Patient recruitment since 1996
Criteria for inclusion of studies to assess efficacy and safety	RCTs and metaanalyses of RCTs, ≥ 10 per treatment group	RCTs (≥ 10 per treatment group) and prospective studies (≥ 100 per treatment group)
Analysis	Narrative review	Pooled event rates drawn from treatment arms of RCTs and nonrandomized cohorts
	Randomized data only	Observational data only
Main efficacy outcome	Objectively diagnosed DVT (asymptomatic or symptomatic) or objectively diagnosed PE	Objectively diagnosed symptomatic PE

*Methods apply only to recommendations concerning chemoprophylaxis. Other recommendations by AAOS are based on "consensus development methods."

Eikelboom et al. Chest 2009; 135:513-520.

Guidelines

- AAOS felt ACCP:
  - Focused on efficacy of treatment of asymptomatic VTE
  - Underestimated the risks of aggressive anticoagulation
    - Hematoma
    - Return to OR
    - Wound healing
    - Infection



- 5. We suggest the use of **pharmacologic agents** and/or **mechanical compressive devices** for the prevention of venous thromboembolism in patients undergoing elective hip or knee arthroplasty, and who are not at elevated risk beyond that of the surgery itself for venous thromboembolism or bleeding.
- No pharmacological agents showed a statistically significant effect in preventing all-cause mortality, symptomatic pulmonary emboli, symptomatic DVT, and major bleeding (page 80 – **Aspirin was included**)

CHEST 2012; 141(2)(Suppl):e278S–e325S

CHEST Supplement

ANTITHROMBOTIC THERAPY AND PREVENTION OF THROMBOSIS, 9TH ED: ACCP GUIDELINES

Prevention of VTE in Orthopedic Surgery Patients

Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines

Yngve Falck-Ytter, MD; Charles W. Francis, MD; Norman A. Johanson, MD; Catherine Curley, MD; Ola E. Dahl, MD; Sam Schulman, MD, PhD; Thomas L. Ortel, MD, PhD; Stephen G. Pauker, MD; and Clifford W. Colwell Jr, MD

- 2.1.1. In patients undergoing total hip arthroplasty (THA) or total knee arthroplasty (TKA), we recommend use of one of the following for a minimum of 10 to 14 days rather than no anti- thrombotic prophylaxis: low-molecular-weight heparin (LMWH), fondaparinux, apixaban, dabigatran, rivaroxaban, low-dose unfractionated heparin (LDUH), adjusted-dose vitamin K antagonist (VKA), **aspirin** (all Grade 1B), or an intermittent pneumatic compression device (IPCD) (Grade 1C).

CLINICAL GUIDELINES

blood advances

10 DECEMBER 2019 • VOLUME 3, NUMBER 23

American Society of Hematology 2019 guidelines for management of venous thromboembolism: prevention of venous thromboembolism in surgical hospitalized patients

David R. Anderson,[1] Gian Paolo Morgano,[2] Carole Bennett,[3] Francesco Dentali,[4] Charles W. Francis,[5] David A. Garcia,[6] Susan R. Kahn,[7] Maryam Rahman,[8] Anita Rajasekhar,[9] Frederick B. Rogers,[10] Maureen A. Smythe,[11,12] Kari A. O. Tikkinen,[13,14] Adolph J. Yates,[15] Tejan Baldeh,[2] Sara Balduzzi,[16] Jan L. Brożek,[2,17] Itziar Etxeandia-Ikobaltzeta,[2] Herman Johal,[18] Ignacio Neumann,[19] Wojtek Wiercioch,[2] Juan José Yepes-Nuñez,[20] Holger J. Schünemann,[2,17] and Philipp Dahm[21,22]

- For patients undergoing total hip arthroplasty or total knee arthroplasty, the ASH guideline panel *suggests* using **aspirin** (ASA) or anticoagulants. When anticoagulants are used, the panel *suggests* using direct oral anticoagulants (DOACs) over low-molecular-weight heparin (LMWH); the panel *suggests* using any of the DOACs approved for use. If a DOAC is not used, the panel *suggests* using LMWH rather than warfarin and *recommends* LMWH rather than unfractionated heparin (UFH).

Which is the best agent?

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Venous thromboprophylaxis after total hip arthroplasty: aspirin, warfarin, enoxaparin, or factor Xa inhibitors?

Abiram Bala, Marlon J Murasko, David R Burk, James I Huddleston, 3rd, Stuart B Goodman, William J Maloney, Derek F Amanatullah

Show less

HIP International

Article Information
Article first published online: April 16, 2019

- **Aspirin** (1.7%) and Factor Xa inhibitors (1.7%) had the lowest incidence of DVT
- **Aspirin** (12%) and Factor Xa inhibitors (12%) had the lowest incidence of blood transfusion
- Similar bleeding related complications

ASA vs. Factor Xa Inhibitors

Complications - Other

Increased Incidence of Bleeding and Wound Complications With Factor-Xa Inhibitors After Total Joint Arthroplasty

Jonathan H. Garfinkel, MS [a], Brian P. Gladnick, MD [b, c, *], Niama Roland, BS, RN [c], David W. Romness, MD [b, c]

[a] Georgetown University School of Medicine, Washington, DC
[b] OrthoVirginia, Adult Hip and Knee Reconstruction, Arlington, Virginia
[c] Virginia Hospital Center, Arlington, Virginia

- All “standard” risk patients
- 325mg BID ASA vs Xa Inhibitor

Conclusion: In our study of total joint patients, factor-Xa inhibitors were associated with a higher incidence of bleeding/wound complications. The choice of VTE prophylaxis should be based on the perceived risks of bleeding and wound complications compared to the risks of VTE in each patient.

JAMA Surgery | Original Investigation

Association of Aspirin With Prevention of Venous Thromboembolism in Patients After Total Knee Arthroplasty Compared With Other Anticoagulants

A Noninferiority Analysis

JAMA Surg. 2019;154(1):65-72. doi:10.1001/jamasurg.2018.3858
Published online October 17, 2018.

Brandon R. Hood, MD; Mark E. Cowen, MD, SM; Huiyong T. Zheng, PhD; Richard E. Hughes, PhD; Bonita Singal, MD, PhD; Brian R. Hallstrom, MD

Table 2. Unadjusted Outcomes by Venous Thromboembolism Prophylaxis Treatment Group

Outcome	No. (%)				*P* Value of Pearson χ^2 Test[a]
	None	Aspirin Only	Anticoagulation	Both	
Total No.	668 (1.61)	12 831 (30.89)	22 620 (54.46)	5418 (13.04)	NA
Composite VTE (death, PE, or DVT)	32 (4.79)	149 (1.16)	321 (1.42)	71 (1.31)	<.001
Death	<10[b]	13 (0.10)	28 (0.12)	<10[b]	NA
Pulmonary embolism	13 (1.95)	41 (0.32)	89 (0.39)	25 (0.46)	<.001
Deep venous thrombosis	16 (2.40)	95 (0.74)	204 (0.90)	41 (0.76)	<.001
Bleeding outcome	10 (1.50)	116 (0.90)	258 (1.14)	73 (1.35)	.03

The Use of Aspirin for Prophylaxis Against Venous Thromboembolism Decreases Mortality Following Primary Total Joint Arthroplasty

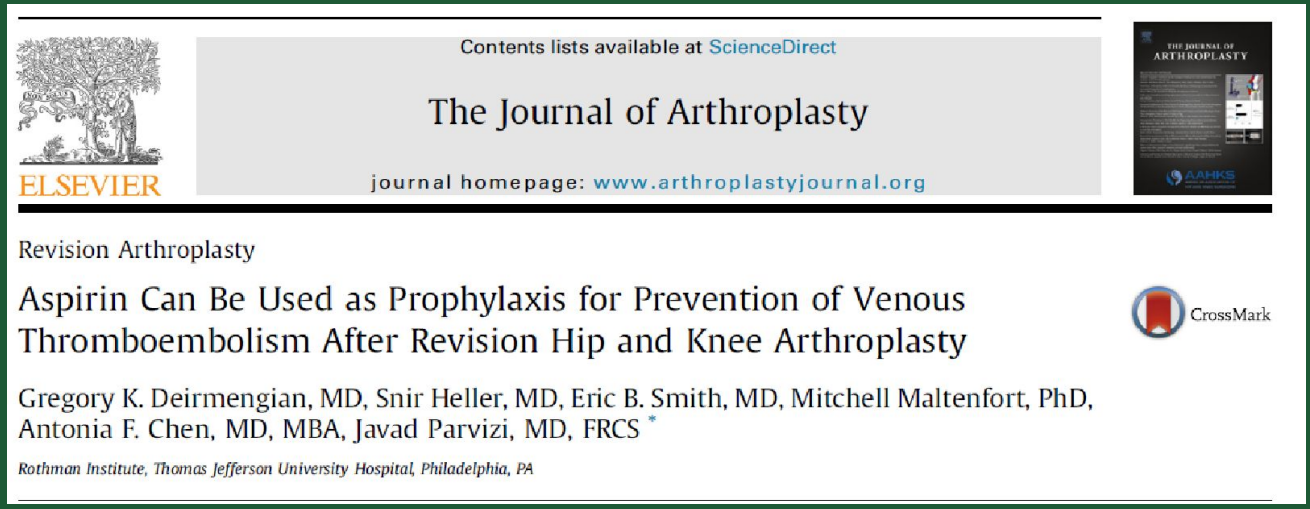
Alexander J. Rondon, MD, MBA, Noam Shohat, MD, Timothy L. Tan, MD, Karan Goswami, MD, Ronald C. Huang, MD, and Javad Parvizi, MD, FRCS

J Bone Joint Surg Am. 2019;101:504-13

% of 30-day mortality	Cardiac	Malignancy	Sepsis/Infection	Pulmonary	CNS	Trauma	VTE	Unknown	All-Cause
Aspirin Cohort (n=8061)	0 (0.00%)	1 (0.01%)	1 (0.01%)	0 (0.00%)	2 (0.02%)	1 (0.01%)	0 (0.00%)	2 (0.02%)	7 (0.09%)
Non-Aspirin Cohort (n=23072)	24 (0.10%)	4 (0.02%)	4 (0.02%)	5 (0.02%)	4 (0.02%)	3 (0.01%)	4 (0.02%)	12 (0.05%)	60 (0.26%)
Overall Cohort (n=31133)	24 (0.08%)	5 (0.02%)	5 (0.02%)	5 (0.02%)	6 (0.02%)	4 (0.01%)	4 (0.01%)	14 (0.04%)	67 (0.21%)

- **Aspirin** as prophylaxis against VTE following TJA may reduce the risk of mortality

Revision Total Joint Arthroplasty



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The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

ELSEVIER

Revision Arthroplasty

Aspirin Can Be Used as Prophylaxis for Prevention of Venous Thromboembolism After Revision Hip and Knee Arthroplasty

Gregory K. Deirmengian, MD, Snir Heller, MD, Eric B. Smith, MD, Mitchell Maltenfort, PhD, Antonia F. Chen, MD, MBA, Javad Parvizi, MD, FRCS *

Rothman Institute, Thomas Jefferson University Hospital, Philadelphia, PA

- Decreased rate of VTEs compared to Warfarin
- Decreased incidence of Bleeding
- Similar infection rate
- **Conclusions: ASA is effective in revision TJA**

The Journal of Arthroplasty 32 (2017) S157–S161

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Primary Arthroplasty

A Comparison of Two Dosing Regimens of ASA Following Total Hip and Knee Arthroplasties

Michael J. Feldstein, MD, SM [a, *], Sara L. Low, MD [b], Antonia F. Chen, MD, MBA [c], Laura A. Woodward, DNP, ANP-C [c], William J. Hozack, MD [c]

- **ASA 81 mg BID** = less GI distress and nausea compared with ASA 325 mg BID
- No difference in GI bleeding

Low-Dose Aspirin Is Effective Chemoprophylaxis Against Clinically Important Venous Thromboembolism Following Total Joint Arthroplasty

J Bone Joint Surg Am. 2017;99:91-8

A Preliminary Analysis

Javad Parvizi, MD, FRCS, Ronald Huang, MD, Camilo Restrepo, MD, Antonia F. Chen, MD, MBA, Matthew S. Austin, MD, William J. Hozack, MD, and Jess H. Lonner, MD

TABLE V Generalized Linear Mixed Model Analysis of Aspirin Dosage as a Fixed Predictor of Complications*

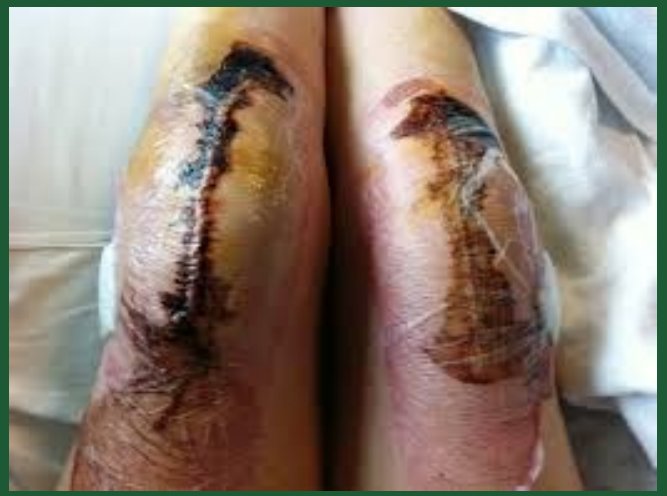
Complication	Odds Ratio†	P Value
Deep venous thrombosis	1.83 (0.19 to 17.45)	0.598
Pulmonary embolism	1.84 (0.22 to 15.83)	0.577
Venous thromboembolism	1.47 (0.29 to 7.59)	0.643
Gastrointestinal complications	0.88 (0.25 to 3.12)	0.838
Periprosthetic joint infection	0.87 (0.19 to 3.88)	0.853
Death	1.20 (0.12 to 11.58)	0.877

*Age, sex, BMI, and surgeon were used as random effects. †The values are given as the odds ratio between the 325-mg aspirin group and the 81-mg aspirin group (both doses given twice daily), with the 95% CI in parentheses.

ASA 81mg BID
not inferior to
ASA 325 BID

Conclusions

- Risk Stratification is key
  - No one perfect validated risk tool exists yet
- Things have changed:
  - Early mobilization
  - Shorter operative times
  - Use of MCDs
  - ASA



- **LESS IS MORE** in the majority of patients

Conclusion

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- Aspirin is here to stay!
- Low dose aspirin good for most patients
- Must risk stratify patients to determine the best VTE prophylaxis

Questions