Spring 5-15-2020

Anticoagulation management in surgical orthopedic patients

Alyssa Jackson
alyssa.christensen@und.edu

Anticoagulation management in surgical orthopedic patients

Alyssa Jackson, BSN, RN MSN Student

Independent Study Nurs 997

Elizabeth Jahn

March 29, 2020

University of North Dakota

PERMISSION

Title Anticoagulation management in surgical orthopedic patients

Department Nursing

Degree Master of Science

In presenting this independent study in partial fulfillment of the requirements for a graduate degree from the University of North Dakota, I agree that the College of Nursing & Professional Disciplines of this University shall make it freely available for inspection. I further agree that permission for extensive copying or electronic access for scholarly purposes may be granted by the professor who supervised my independent study work or, in his/her absence, by the chairperson of the department or the dean of the Graduate School. It is understood that any copying or publication or other use of this independent study or part thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University of North Dakota in any scholarly use which may be made of any material in my independent study.

Signature 

Date 03/19/2020

Abstract

There are approximately two million people on chronic anticoagulation in the United States, and at least 250,000 people will require some interruption in their anticoagulation. Managing interruptions in anticoagulation is a complex process for providers. Ten relevant articles were reviewed and envaulted for current practices related to the management of the safest and effective way to manage anticoagulation for surgical procedures. Orthopedic surgery comes with an increased risk of thromboembolism, therefore a reduction of thrombosis through optimization of anticoagulation management is imperative. Important considerations include the utilization of a CHA2D2-VASC score can be helpful to determine the thromboembolic risk factor for the patient, there are factors to look at when deciding whether or not to bridge warfarin, and direct oral thrombin inhibitors or factor XA inhibitors bridging is generally not recommended

Keywords: bridging anticoagulation, orthopedic surgery

Anticoagulation management in surgical orthopedic patients

There are more than two million people in North America who are on chronic anticoagulation therapy (Nazha & Spyropoulos, 2016). Yearly at least 250,000 people will require their anticoagulation to be interrupted due to elective procedures (Nazha & Spyropoulos, 2016). Interruptions of these anticoagulants can increase the risk of thromboembolic events but continuing them results in an increased risk of bleeding-related complications.

The most frequently used anticoagulants are warfarin which is a vitamin K antagonist, and a direct-acting oral anticoagulant (DOAC) like Xarelto, or Eliquis. There are differences between how to stop or manage these two different anticoagulants when it comes to the pre-operative time. Warfarin, a vitamin K antagonist,-inhibits clotting factors two, seven, nine, and ten. It is monitored via the international normalized ratio and has a half-life of approximately 36 hours. Direct-acting oral anticoagulants directly inhibit selected components of the clotting cascade and have a much more rapid onset and offset of action that warfarin. Warfarin requires weekly to monthly lab monitoring to monitor the level of medication in the bloodstream, and dose adjustments often needed. Direct acting oral anticoagulation do not require this type of monitoring and are increasing in use and popularity due to not needing lab monitoring. Increasing the ease ability for patients taking DOACs. A major downfall of DOACs is that the reversal agents are extremely expensive and reversing DOAC anticoagulation can be difficult.

The purpose of this paper is to identify the best way to manage patients that are on long term anticoagulation preoperatively who are undergoing orthopedic surgery. A literature review was performed to evaluate the optimal way to reduce post-operative clotting risk in patients on long term anticoagulation undergoing orthopedic surgery.

Case Study

46-year-old female being seen for preoperative evaluation prior to a right knee arthroscopy for a meniscal tear which happened approximately six months ago. She has a past medical history of hypertension, obesity, type two diabetes, hypothyroidism, and squamous cell skin carcinoma. Past surgical history of hysterectomy, skin biopsy and c-section. She denies having any prior issues with anesthesia or any bleeding complications during her last surgeries. She has allergies to amoxicillin and morphine. Current medications include Lisinopril 10 mg daily, Metformin 1000 mg BID, Rybelsus 7 mg daily, Synthroid 125 mcg daily, aspirin 81 mg daily, Tylenol 1,000 mg three times a day and 600 mg of ibuprofen three times a day as needed for pain. She is a current smoker with a smoking history of one ppd for 20 years. She uses alcohol very rarely and denies illicit drug use. Her family history included:

- Father- coronary artery disease with stenting times three at age 55, prostate cancer, hypertension, and hyperlipidemia.
- Mother – breast cancer at age 60, hypertension and obesity.
- Maternal grandmother- hypertension and breast cancer.
- Paternal grandfather- hypertension and melanoma.
- Paternal grandmother- cerebral vascular accident at age 80.

Vital signs were reviewed blood pressure 136/88 pulse 78 temperature 98.5 SPo2 95% height 5’ 6” weight 2ll lbs. BMI 34. Her review of symptoms was positive for right knee pain, otherwise, all other symptoms were negative. The physical exam was unremarkable. Labs that were ordered and reviewed included TSH, CMP, CBC, hgb a1c and an EKG. These were all within normal limits with no abnormalities noted. She may proceed with her procedure per guidelines set by anesthesia.

Counseling was done on medications to take and hold for her upcoming procedure as well as instructions prior to the procedure. Nothing by mouth after midnight the morning of the procedure. She was instructed to hold her aspirin and NSAIDs for seven days before the procedure. She may take her metformin, rybelsus, and Synthroid the morning of her procedure with a sip of water. If needed for pain control, she may take her Tylenol the morning of with a sip of water as well, but she is instructed to inform the anesthetist if she does. Hold her lisinopril the morning of. She was in agreeance with this plan and had no further questions.

Discussion of Search Strategies

A literature search was performed using the Cumulative Index of Nursing and Allied Health Literature (CINAHL) and the PubMed database. In the CINAHL database, keywords used in the search included a combination of terms including (a) "bridging anticoagulation" (b) "orthopedic surgery" (c)" adults". The search was limited to the last five years, included only peer-reviewed articles, and English text only. These limitations were intended to ensure the literature was current and applicable to the purpose of this literature review. The search identified three articles in the CINAHL database that fit the criteria to be used in various phases of the literature review. Two articles were saved from this database to use in the research paper.

In the PubMed database, keywords used in the search included a combination of terms including (a) "bridging anticoagulation" (b) "orthopedic surgery" (c) "adults" The search was limited to the last five years, included only peer-reviewed articles, and English text only. These limitations were intended to ensure the literature was current and applicable to the purpose of this literature review. The search identified 26 articles in the PubMed database that fit the criteria to be used in various phases of the literature review. 11 articles were saved from this database to use in the research paper.

A hand search of the reference lists of each study that was retained from both PubMed and CINHAL was completed for any relevant studies that had not been found in the original searches five additional articles were retained for review.

Literature Review

Orthopedic surgery disrupts several of the prothrombotic processes like coagulation activation from tissue and bone injury, venous injuries, reduced venous emptying intra-or post-surgery and immobilization (Bass, 2020). Patients who are on anticoagulation medications and who require orthopedic surgery pose additional surgical consideration and may need to be considered for the bridging of their anticoagulants. Bridging is the process where an oral anticoagulant is discontinued and replaced by a subcutaneous or intravenous anticoagulant before and/or following an invasive procedure. There are a number of factors that need to be considered when deciding if a patient needs to be bridged for a surgical procedure. Frequently low molecular weight heparin-like Lovenox or unfractionated heparin is utilized to bridge patients. Factors that need to be considered include perioperative hematologic complications such as thromboembolism and postoperative hemorrhage. Orthopedic patients that are on chronic anticoagulation are at risk for thromboembolic and hemorrhagic complications.

Current ACC/ACH heart rhythm society and European society of cardiology guidelines recommend using the CHA2D2-VASC score which identifies risk for thrombolic event, to help determine if a patient taking anticoagulant should be bridged for the procedure or not (Doherty et al., 2017). The CHA2D2-VASC score gives a number, depending on the patient's number or score they are then classified into categories from mild risk to high risk for a thrombolic event. Patients who score above a five are recommended for bridging of anticoagulation, if their score is under a five they do not require bridging. Other factors to consider are the reasons why the

person is on anticoagulation, which may include atrial fibrillation, prosthetic heart valves, or recent venous or arterial thromboembolism within the preceding three months (Doherty et al., 2017). Depending on the reason why the patient is anti-coagulated will correlate to the amount of time that a patient is required to be on anticoagulation. Patients that have atrial fibrillation often require lifelong anticoagulation as well as patients who have a mechanical heart valve. While patients who have had a recent bioprosthetic heart valve, or a recent history of thromboembolism often only require anticoagulation for the first three to six months (Doherty et al., 2017).

Estimating the procedural risk of bleeding should always be considered when managing anticoagulation for patients undergoing surgery. Generally, procedures are divided into high and low bleeding risk. Orthopedic surgeries generally would fit under the high bleeding risk category due to the fact that many of these procedures last greater than 45 minutes. There is a score that can help practitioners decide bleeding risk. This score is called the HAS-BLED score. This score assigns one point each for hypertension, abnormal renal or liver function, stroke, bleeding tendency, labile INRS, elderly age and antiplatelet drugs or alcohols (GY, 2011).

Bridging may be appropriate in patients who have very high thromboembolic risk if their anticoagulant is discontinued. In patients who are on shorter-acting direct oral thrombin inhibitors or factor XA inhibitors, bridging is generally not used. Bridging is recommended for patients taking warfarin who have had an embolic stroke within the last three months, mechanical mitral or mechanical aortic valve, atrial fibrillation and a very high risk of stroke: a CHADs2 score of five or six, history of stroke in the last 12 weeks, venous thromboembolism within the previous three months, recent coronary stenting, or previous thromboembolism during interruption of chronic anticoagulation (Douketis et al., 2015).

For patients that do not have any of the stated risk factors, bridging anticoagulation is not suggested. The BRIDGE trial looked at 1884 patients with atrial fibrillation who required interruption of warfarin for an invasive procedure with LMWH versus a placebo (Douketis et al., 2015). The incidence of a thromboembolic event thirty days post-op was similar in those who received the LMWH or placebo. The incidence of bleeding in patients who received the LMWH was higher than those who received the placebo. Findings showed that the average atrial fibrillation patient undergoing surgery with warfarin simply held for five days before the procedure and reinitiated within a day of the procedure did not require bridging.

The ORBIT-AF study examined data on oral anticoagulation interruption among 2200 patients in the United States. Findings showed that patients who received bridging therapy accounted for 24% of interruptions and had a slightly higher CHADS2 score then non-bridged groups, with no significant differences in the rate of stroke or systemic embolism being detected between the two groups (Steinberg et al., 2017).

RE-LY trial which compared dabigatran to warfarin in nonvalvular AF. 1424 warfarin interruptions where studied, 27.5% of them were treated with bridging therapy (Avezum et al., 2018). The CHADS2 or CHA2DS2-VASC scores were similar in the bridged groups and the non-bridge groups. A higher rate of major bleeding was found in the bridged group, with no statistically significant difference in stroke and systemic embolism compared to the non-bridge group (Avezum et al., 2018).

Phillips, Dan, Schaefer, & Randle, 2015 evaluated bridging in patients undergoing total knee arthroplasty. This study was a retrospective case-control series that involved 61 patients on warfarin and 61 control patients. Perioperative hemoglobin, transfusion rates, complications rates, demographics, rang of motion and length of stay were evaluated between the two groups.

There was no statistically significant difference between the two groups. Findings demonstrated that warfarin cessation for patients undergoing total knee arthroplasty was not necessary. It was shown that the continuation of warfarin is a safe and efficient form of perioperative anticoagulation in patients undergoing total knee arthroscopy.

Bridging therapy can also increase the risk of bleeding-related complications. Haighton et al., 2015 published a retrospective cohort study of all patients with primary total hip or total knee replacement in a four year period. This study looked at patients who received bridging for the anticoagulation versus a patient who did not require bridging for their anticoagulation. Patients were bridged with either low molecular weight heparin or unfractionated heparin. The patients that did not receive bridging for their oral anticoagulant were started on low molecular weight heparin the evening before surgery and continued for six weeks postoperatively. Out of 2529 patients undergoing a total hip or a total knee 35 patients required bridging therapy (Haighton et al., 2015). Patients that were bridged had a significantly higher complication rate and more bleeding-related complications.

Leijtens, van de Hei, Jansen, & Koeter (2014) looked at patients receiving low molecular weight heparin bridging during a total hip or a total knee surgery. They identified 972 patients, of which 13 patients required bridging per ACCP guidelines (Leijtens et al., 2014). Twelve patients experienced bleeding complications, seven patients received a blood transfusion, nine develop a hematoma and two had a periprosthetic joint infection (Leijtens et al., 2014). There was no thromboembolism complication observed in any of the patients. This brings to light the importance of balancing the risk of bleeding over the risk of thromboembolism in patients who are coagulated and will be undergoing a total hip or total knee surgery.

If the patient qualifies or requires bridging or interruption of their anticoagulation for surgery, there are guidelines for when to stop anticoagulation. Warfarin is typically omitted for five days before elective surgery, this timing is based on the biological half-life of warfarin which is 36 to 42 hours (Douketis & Lip, 2020). An INR is checked the day before the procedure, and then warfarin is typically restarted 12 to 24 hours after surgery, when restarted it takes five to 10 days to become therapeutic again (Douketis & Lip, 2020). The direct oral anticoagulants like Xarelto and Eliquis are discontinued two to three days before a procedure, and then restarted two to three days after high-risk bleeding procedures, and then started on the dose the patient was previously on (Douketis & Lip, 2020).

Three days prior to surgery is when bridging is initiated for applicable patients. Low molecular weight heparin is discontinued 24 hours before the planned procedure. Unfractionated heparin is discontinued four to five hours before the procedure if being used intravenously if being used subcutaneously the last dose is given the night before procedure (Douketis & Lip, 2020).

After the procedure the resumption of unfractionated heparin and LMW heparin is similar. Once it has been decided that adequate homeostasis has been obtained then these can be restarted. Postoperatively warfarin is generally resumed on the same postoperative day as the heparin or LMW heparin, which is then discontinued when the INR reaches the therapeutic range (Douketis & Lip, 2020).

Take-home points

Managing patients on anticoagulation undergoing orthopedic surgery can be very complex. There are many factors to consider when addressing anticoagulation. Some main key points to remember are:

- Look at a CHA2D2-VASC score to help determine the thromboembolic risk factor for the patient.
- Bridging is recommended for patients taking warfarin who have had:
    - embolic stroke within the last three months,
    - mechanical mitral or mechanical aortic valve
    - atrial fibrillation
    - a very high risk of stroke meaning a CHADs2 score of five or six, or a history of stroke in the last 12 weeks.
    - venous thromboembolism within the previous three months
    - recent coronary stenting
    - previous thromboembolism during interruption of chronic anticoagulation.
- Studies have shown if the above criteria are not met, it is not necessary to bridge these patients.
- Patient's taking direct oral thrombin inhibitors or factor XA inhibitors bridging is generally not used.

Conclusion

When a patient that is anticoagulated is undergoing any type of surgical procedure, often times their anticoagulation needs to be interrupted. The timing of interruption and if they are bridged with low molecular weight heparin or unfractionated heparin depends on many factors. The type of anticoagulation they are on, the type of procedure they are going to be having done, and what is the reason they are anticoagulated. There are some helpful algorithms and scores to

look at that are helpful for clinicians when trying to decide when and how to interrupt anticoagulation.

References

Avezum, A., de Figueiredo Oliveira, G. B., Diaz, R., Antonio, J., Hermosillo, G., Oldgren, J., ... Connolly, S. J. (2018, June 27). Efficacy and safety of dabigatran versus warfarin from the RE-LY Trial. *Open Heart*, 1-9. http://dx.doi.org/10.1136/openhrt-2018-000800

Bass, A. R. (2020). Venous Thromboembolism and Orthopedic Surgery. *Perioperative Care of the Orthopedic Patient*, 295–305. http://dx.doi: 10.1007/978-3-030-35570-8_24

Doherty, J. U., Gluckman, T. J., Hucker, W. J., Januzzi, J. L., Ortel, T. L., Saxonhouse, S. J., & Spinler, S. A. (2017, February 21, 2017). 2017 ACC Expert consensus decision pathway for periprocedural management of anticoagulation in patients with nonvalvular atrial fibrillation. *Journal of the American College of Cardiology, 69*, 871-898. http://dx.doi.org/10.1016/j.jacc.2016.11.024

Douketis, J. D., & Lip, G. Y. (2020). Perioperative management of patients receiving anticoagulants. In L. K. Leung & J. S. Tirnauer (Eds.), *UpToDate*. Retrieved from http://www.uptodate.com/contents/perioperative-management-of-patients-receiving-anticoagulants

Douketis, J. D., Spyropoulos, A. C., Kaatz, S., Becker, R. C., Caprini, J. A., Dunn, A. S., ... Turpie, A. (2015). 2015. *New England Journal of Medicine, 373*, 823-833. http://dx.doi.org/10.1056/NEJMoa1501035

GY, L. (2011). Implications of the Cha(2)DS(2)-VASc and HAS-BLED scores for thromboprophylaxis in atrial fibrillation. *American Journal of Medicine, 123*. http://dx.doi.org/10.1016/j.amjmed.2010.05.007

Haighton, M., Kempen, D. H., Wolterbeek, N., Marting, L. N., van Dijk, M., & Veen, R. M. (2015). Bridging therapy for oral anticoagulation increased the risk for bleeding

complications in total joint arthroplasty. *Journal of Orthopaedic Surgery and Research*, *10*, 1-8. http://dx.doi.org/10.1186/s13018-015-0285-6

Leijtens, B., van de Hei, K. K., Jansen, J., & Koeter, S. (2014). High complication rate after total knee and hip replacement due to perioperative bridging of anticoagulant therapy based on the 2012 ACCP guideline. *Arch Orthop Trauma Surg*, *134*, 1335-1341. http://dx.doi.org/10.1007/s00402-014-2034-4

Nazha, B., & Spyropoulos, A. C. (2016, January 1). The BRIDGE trial: what the hospitalist should know. *Journal of Hospital Medicine, 11*, 652-658. http://dx.doi.org/10.1002/jhm.2594

Phillips, A., Dan, M., Schaefer, N., & Randle, R. (2015). Warfarin cessation is non-essential in patients undergoing total knee arthroplasty-a case-control study. *Journal of Orthopedic Surgery and Research*, *10*(16), 1-7. http://dx.doi.org/10.1186/s13018-015-0153-4

Steinberg, B. S., Gao, H., Shrader, P., Pieper, K., Thoman, L., Camm, A. J., ... Naccarelli, G. (2017). International trends in clinical characteristics and oral anticoagulation treatment for patients with atrial fibrillation: results from the GARFIELD-AF, ORBIT-AF I, and ORBIT-AF II registries. *American Heart Journal*, *194*, 132-140. http://dx.doi.org/10.1016/j.ahj.2017.08.011