

Transanal hemorrhoidal dearterialization (THD): a safe procedure for the anticoagulated patient?

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Abstract

Background Approximately one in five persons living in the USA is maintained on oral anticoagulation. It has typically been recommended that anticoagulation be withheld prior to hemorrhoidal procedures. Transanal hemorrhoidal dearterialization (THD) is a minimally invasive treatment for symptomatic hemorrhoids, and outcomes with patients on anticoagulation who have undergone this procedure have not been previously reported. Here, we report our preliminary results of patients who underwent THD while on anticoagulation.

Methods During a 53-month period (February 2009–July 2015), patients with symptomatic hemorrhoids refractory to medical management who underwent surgical treatment with THD were retrospectively reviewed. The subset of patients who underwent THD while anticoagulated was compared to a cohort of patient who were not taking anticoagulation and who otherwise demonstrated normal coagulation profiles and who did not have a known predisposition to bleeding or inherited coagulopathy. The primary study endpoint was to assess postoperative bleeding in patients who were maintained on anticoagulation before and after surgery.

Results During the 53-month study period, 106 patients underwent the THD procedure for symptomatic hemorrhoids. Of these, seventy patients underwent THD without anticoagulation therapy, while 36 patients underwent THD while taking one or more oral anticoagulants. The postoperative morbidity between the two cohorts was similar, and specifically there was no statistical difference in the

rate of postoperative hemorrhage (19.4 vs. 15.7 %; odds ratio 1.295, 95 % CI 0.455–3.688, $p = 0.785$). No patient, in either cohort, required re-intervention for any reason during the study period. Patients who underwent THD while on anticoagulation were less likely to have recurrent hemorrhoidal disease during the study's 6-month median follow-up period (2.8 vs. 7.1 %, $p = 0.049$).

Conclusions These preliminary data reveal that THD can be performed on anticoagulated patients without cessation of oral agents without increasing morbidity from postoperative bleeding.

Keywords THD · Anticoagulation · Postoperative hemorrhage · Transanal hemorrhoidal dearterialization · Hemorrhoids

Introduction

A significant proportion of the Western population is prescribed maintenance anticoagulation with a variety of agents including oral acetylsalicylic acid (ASA), warfarin, clopidogrel, and/or direct thrombin inhibitors. Approximately one in five (19.3 %) persons living in the USA is maintained on monotherapy with the oral antiplatelet medication ASA [1, 2]. Among individuals aged 45–75, the incidence is higher, with more than half (52 %) of this population segment taking oral ASA therapy daily [2]. Clopidogrel has also become an anticoagulant of choice, and in 2010 it was the second most prescribed drug in the world, generating a \$9 billion industry [3]. Warfarin, although less utilized than other anticoagulants, is commonly administered, and a total of 1 % of the UK's 64.1 million population is prescribed this medication annually [4]. Combined, up to one-quarter of the adult population in

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the USA and Europe are estimated to be taking oral anticoagulation as monotherapy or as a multi-drug regimen (e.g., combination of ASA and clopidogrel). Because of this, surgeons must contend with the anticoagulated patient. With the increasing use of synthetic, direct thrombin inhibitors, e.g., argatroban (univalent), hirudin (bivalent), surgeons must also be able to surgically manage this subset of patient for which reversal is not always possible [5], and only recently andexanet alfa has been shown to reverse factor Xa inhibitors (apixaban and rivaroxaban) when given minutes after administration of these anticoagulants [6].

The frequent use of anticoagulation has likely led to an increased incidence of patients presenting with clinically significant internal hemorrhoidal bleeding. When medically refractory, surgeons must consider invasive procedures and surgery to resolve patient symptoms, and in some instances the cessation of anticoagulation or dose reduction is not safe.

One in 20 Americans and almost one-half of persons older than 50 experience hemorrhoidal symptoms during their lifetime, and surgical intervention is often required [7, 8]. It is recommended that anticoagulation—including ASA—be withheld for 7 days prior to office-based procedures, such as hemorrhoidal banding, or surgical interventions, such as hemorrhoidectomy and especially procedure for prolapsed hemorrhoids (PPH) [9, 10]. The risk of significant bleeding after hemorrhoidal banding, although uncommon, has been well documented [11–13]. Post-hemorrhoidectomy bleeding also occurs, to a lesser degree—approximately 1 % of the time [14]—range 0.5–2.0 % [15]. In one series, among the patients who had post-hemorrhoidectomy bleeding, 37 % were on maintenance anticoagulation [15]. For these reasons, most surgeons and society guidelines recommend that anticoagulation be held prior to hemorrhoidal surgery and procedures. However, whether or not this is mandatory for all types of hemorrhoidal procedures has not been fully studied. Transanal hemorrhoidal dearterialization (THD) is a relatively recent minimally invasive treatment for symptomatic hemorrhoids and may have important advantages over conventional hemorrhoidectomy [16–18]. Its application toward the control of rectal outlet bleeding has been previously realized [19]. However, outcomes with patients on anticoagulation who have undergone THD have not been previously reported, to our knowledge. Here, we report our preliminary results of patients who underwent THD while on anticoagulation and compared them to a cohort of patients who underwent THD without anticoagulation.

Materials and methods

During a 53-month period (February 2009–July 2015), patients with symptomatic hemorrhoids refractory to medical management who underwent surgical treatment with

THD were retrospectively reviewed. The study was performed with internal review board (IRB) approval [Florida Hospital, Orlando, FL USA, IRB #670312-2], and all THD operations were performed at a single hospital system. The data were collected, tabulated, and placed into a prospective database, which was then analyzed retrospectively.

Under the study protocol, patients taking oral anticoagulation medications continued taking these medications before and after the procedure, but anticoagulation was held on the day of surgery. Exclusion criteria included patients on warfarin with an international normalized ratio (INR) greater than 3X normal and patients with a platelet count measuring <10,000, known inborn error of metabolism with coagulopathy due to genetic mutation, age <18 or >95, and severe comorbidity (ASA IV, or higher).

The subset of patients who underwent THD while anticoagulated was compared to patient who were not taking anticoagulation and who otherwise demonstrated normal coagulation profiles (PT, PTT, INR, and PLT) and who did not have a known predisposition to bleeding or inherited coagulopathy. Indication for THD was the same in both cohorts. The indications were medically refractory hemorrhoidal disease in patients who failed to respond to standard conservative therapy, including dietary changes and topical corticosteroid application in combination with (a) persistent, clinically significant rectal outlet hemorrhage and/or (b) grade III hemorrhoidal prolapse in more than one hemorrhoidal column according to the Goligher classification system [20]. The primary study endpoint was to assess postoperative bleeding in patients who were on anticoagulation. The secondary endpoint was control of hemorrhoidal disease with THD.

Surgical technique

THD was performed in a standardized fashion with figure-of-eight ligation using absorbable suture under Doppler guidance at six positions correlating with the odd numbers of the clock in the patient positioned in dorsal lithotomy. No fewer than 6 ligations were performed on each patient, but if a Doppler signal was detected after 6 ligations, then an additional suture ligation was performed, up to a maximum of eight. Mucopexy was performed for all patients with prolapsing hemorrhoidal mucosa, and the number of columns in which mucopexy was performed varied depending on degree and number of hemorrhoidal columns which exhibited prolapse. The surgical technique for THD was the same regardless of whether or not the patients were on anticoagulation.

Statistical analysis

Data analyses were performed using the SPSS version 20.0 (SPSS Inc., Chicago, Illinois, USA). A two-sided Fisher's

exact test was used, and odds ratio analysis was conducted to evaluate the differences between the two cohorts. A statistical difference was denoted by $p \leq .05$, and all clinically relevant data were evaluated in each of the two study cohorts.

Results

During the 53-month study period, 106 patients underwent the THD procedure for symptomatic hemorrhoids. Of these, seventy patients underwent THD without anticoagulation therapy, while 36 patients underwent THD while taking one or more oral anticoagulants, without discontinuation except for the day of surgery. There was no statistical difference in the demographics of the two groups or the hemorrhoidal grade (Table 1). However, prolapse was more likely to be the indication for THD for the cohort of patients not taking anticoagulation, while bleeding was more likely to be the reason why THD was performed on anticoagulated patients. There was no statistical difference between median operative times, which measured 31 min (14–102 min) for patients on anticoagulation and 28.5 min (18–76 min) for patients off anticoagulation. Interestingly, the median blood loss was less during THD in which patients were anticoagulated, with 15 ml (5–15 ml) vs. 20 ml (2–100 ml) for patients not on anticoagulation, $p = 0.03$. The postoperative morbidity between the two cohorts was similar, and specifically there was no statistical difference in the rate of postoperative hemorrhage (19.4 vs. 15.7 %; odds ratio 1.295, 95 % CI 0.455–3.688, $p = 0.785$) (Table 2). Of the 7 patients who presented with

postoperative bleeding in the anticoagulated cohort, two presented to the emergency center. One of these presentations was on postoperative day 11 in a 73-year-old male on apixaban monotherapy, while the other was on postoperative day seven in a 73-year-old male who was on monotherapy with 81 mg ASA. Neither patient required re-intervention, admission, or transfusion as these were self-limited bleeding events that resolved without therapy. The remaining 5 patients only reported self-limited bleeding on their 4-week follow-up appointment. No patient, in either cohort, required re-intervention for any reason during the study period. Patients who underwent THD while on anticoagulation were less likely to have recurrent hemorrhoidal disease during the study's 6-month (3–24 months) median follow-up period (2.8 vs. 7.1 %, $p = 0.049$).

The type of anticoagulation varied and is detailed in Table 3. The most common type of anticoagulation was once daily oral 81 mg ASA with 20/36 (55.6 %) taking this medication once daily. Of the seven patients in the THD + anticoagulation group who experienced bleeding in the postoperative period, only two were on ASA monotherapy, while 5/7 were taking warfarin as monotherapy or dual anticoagulation therapy in combination with either fondaparinux, enoxaparin, or apixaban (Table 3).

Discussion

The approach to the treatment of hemorrhoidal disease remains individualized, and management often requires the ability to provide a spectrum of interventions based on

Table 1 Clinical characteristics of patients undergoing THD

| | THD on anticoagulation (%) | THD off anticoagulation (%) | <i>p</i> value |
|----------------------------------|----------------------------|-----------------------------|----------------|
| <i>n</i> | 36 | 70 | |
| Age (range) ^a (years) | 64 (35–79) | 48 (22–86) | NS |
| Male/female | 2.6:1 | 1.6:1 | |
| BMI ^a | 28 (24–35) | 27 (23–33) | NS |
| Grade of hemorrhoid ^b | | | |
| Grade 1 | 5 (13.8) | 10 (14.2) | |
| Grade 2 | 17 (47.2) | 35 (50.0) | |
| Grade 3 | 13 (36.1) | 24 (34.2) | |
| Grade 4 | 1 (2.7) | 1 (1.4) | |
| Presenting preoperative symptoms | | | |
| Bleeding ^c | 33 (86.8) | 49 (73.1) | 0.006 |
| Prolapse ^c | 9 (25.0) | 27 (38.5) | 0.0004 |
| Other ^c | 10 (26.3) | 8 (11.9) | NS |

THD Transanal hemorrhoidal dearterialization, BMI Body mass index expressed in kg/m²

^a Age and BMI reported as median (range)

^b Grade of hemorrhoid and presenting symptoms reported in absolute value. Patients reported by preoperative graded severity of hemorrhoids according to Goligher's classification

^c Presenting preoperative symptoms (bleeding, prolapse, and other) reported as absolute values

Table 2 Operative outcomes for patients undergoing THD

| | THD on anticoagulation (%) | THD off anticoagulation (%) | <i>p</i> values |
|--------------------------------|----------------------------|-----------------------------|-----------------|
| OR time ^a | 31 (14–102) | 28.5 (18–76) | NS |
| EBL ^a | 15 (5–50) | 20 (2–100) | 0.03 |
| ASA score ^a | 2.2 | 1.4 | |
| Mucopexy ^b | 33 (91.7) | 54 (77.1) | 0.019 |
| Postop morbidity | | | |
| Bleeding ^b | 7 (19.4) | 11 (15.7) | NS |
| Pain ^b | 7 (19.4) | 9 (12.8) | NS |
| Urinary retention ^b | 1 | 1 | NS |
| Recurrence ^b | 1 (2.8) | 5 (7.1) | 0.049 |

THD Transanal hemorrhoidal dearterialization, OR time Median operating time in minutes (range); EBL Median estimated blood loss in milliliters (range); ASA American Society of Anesthesiologists score reported as mean

^a values reported in median (range)

^b Mucopexy, bleeding, pain, urinary retention, and recurrence reported in absolute value (percent); NS Not significant

Table 3 List of specific anticoagulation medications for patients who underwent THD while on anticoagulation

| | Patients on anticoagulation (<i>n</i>) | Postoperative bleeding (<i>n</i>) |
|-------------------------|--|-------------------------------------|
| Aspirin 81 mg | 20 | 1 |
| Aspirin 325 mg | 5 | 1 |
| Clopidogrel | 3 | 0 |
| Warfarin | 3 | 2 |
| Apixaban | 1 | 1 |
| Apixaban + warfarin | 1 | 1 |
| Fondaparinux + warfarin | 1 | 1 |
| Enoxaparin + warfarin | 1 | 0 |
| Aspirin/dipyridamole | 1 | 0 |
| Total | 36 | 7 |

THD Transanal hemorrhoidal dearterialization

extent, chronicity, and pathoanatomy. But treatment must also be tailored to a given patient in the context of clinical parameters, which commonly—and importantly—include the requirement for anticoagulation [21, 22]. This is a key component of the surgeon's decision matrix when determining how to proceed with intervention, once surgery is considered a necessary pathway toward ameliorating hemorrhoidal symptoms. Physicians and surgeons understand that some patients present an increased risk of thromboembolic or cardiac events when anticoagulation is held—even temporarily. In the ROCKET AF trial, 4.8 % of patients experienced gastrointestinal (GI) bleeding and 29 % rectal origin [23]; however, the risk of gastrointestinal bleeding related to novel oral anticoagulants appears similar to that of warfarin [24].

Furthermore, there is a risk of so-called rebound hypercoagulability in patients who undergo cessation of anticoagulants and then restart them, thus increasing the

risk of adverse thrombotic events [25–27]. For patients with bare-metal or drug-eluting stents [28, 29], prosthetic heart valves [30, 31], recent prosthetic peripheral arterial grafts [32], and recent thromboembolic events [33], the risk of anticoagulant cessation can be significant. Thus, for select patients, the surgeon must estimate the procedural bleeding risk and weigh this against the estimated thromboembolic or cardiac event risk when deciding whether or not anticoagulation can be safely interrupted, and whether or not bridging is required [34–40].

In this study, it is demonstrated that the incidence of hemorrhage requiring intervention after THD is not statistically different between anticoagulated and non-anticoagulated patient cohorts undergoing the procedure. These early data suggest that THD could be a safe operation for anticoagulated patients, which is an important clinical demographic confronting colorectal surgeons. However, the authors recognize important limitations of this study, which are principally the small sample size and the retrospective non-randomized nature of the study design. A blinded, randomized trial in which patients already on anticoagulation were assessed for the morbidity of postoperative hemorrhage and also thromboembolic events would be necessary to support or refute the validity of performing THD on patients on systemic anticoagulation therapy. Furthermore, the study is limited by the heterogeneity of the types of anticoagulation agents, and because the majority (55.6 %) of the anticoagulated cohort were on monotherapy with low-dose, oral 81 mg ASA. Since complications of aspirin treatment increase proportionally with dose, the results of the present study may not reflect the complication rate of patients taking moderate (100–200 mg/day) or high (>200 mg/day) doses [41]. Notwithstanding, in this study only two patients (5.6 %) in the anticoagulated cohort presented for medical evaluation

after THD at an emergency center, but neither required transfusion, surgical intervention, or other specific therapy and were categorized as self-limited postoperative hemorrhage. Thus, for high-risk cardiovascular patients the need to bridge with low molecular weight heparin as a bridge to surgery may be obviated by using THD procedure—without significantly increasing the risk of postoperative bleeding.

Because patients with cardiovascular disease are often recommended to remain on anticoagulation to maintain homeostasis and also to prevent the described phenomenon of rebound hypercoagulability, surgeons must often tailor the approach to hemorrhoidal disease based on these factors which can restrict the safe and permissible options to manage hemorrhoidal disease. For example, many experts do not recommend hemorrhoidal band ligation for anticoagulated patients unless the anticoagulation has been held prior to (and after) hemorrhoidal ligation [42, 43]. Likewise, excisional hemorrhoidectomy mandates that anticoagulation be held due to the increased risk of significant bleeding postoperatively. THD could be a ‘middle ground’ between less invasive procedures such as hemorrhoidal band ligation and excisional procedures (Ferguson or Milligan–Morgan) for hemorrhoidal treatment, for which—as these data suggest—the cessation of oral anticoagulation may not be necessary.

Conclusions

These preliminary data suggest that THD can be performed on anticoagulated patients without cessation of oral agents without increasing the morbidity from postoperative bleeding. Although encouraging, the small sample size limits the overall generalizability of the study findings, and further investigation is necessary prior to concluding that THD should be routinely performed without prerequisite cessation of oral anticoagulants.

Compliance with ethical standards

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Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This research was conducted in accordance with the ethical standards set forth by the institution and are in compliance with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent All patients enrolled in this study received informed consent as mandated by the code of ethics at our institution and by the internal review board.

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