

The effects of long-term blood-thinner usage on the operative complications and patient-reported outcome measures of elective lumbar microdecompression surgery

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Abstract

Aims An increasing number of patients who undergo lumbar microdecompression surgery also have a history of blood-thinner usage secondary to cardiovascular and other co-morbidities. This study aimed to investigate how long-term blood-thinner usage in patients before operation affects surgical and patient-reported outcome measures (PROMs) of elective lumbar microdecompression surgery.

Methodology Surgical outcomes were retrospectively compared in 26 patients who were on blood-thinners (BT) and 30 patients not on blood-thinners (NBT) who underwent elective lumbar microdecompression surgery.

Results There were no statistically significant differences in the rates of venous thromboembolisms, wound complications, dural tears, neurological complications, blood transfusions or bleeding complications between BT and NBT groups. The NBT and BT group had similar improvements in postoperative pain and functional scores. In addition, even when patients continued blood-thinner use intraoperatively, long-term pre-operative blood-thinner usage did not correlate with increased incidence of operative complications or lower levels of patient improvement postoperatively following elective lumbar microdecompression surgery.

Conclusions This study's results show that patients with long-term blood-thinner use are not at higher risk of important postoperative complications than patients not on blood thinners, even if they continue blood-thinner use intraoperatively. Additionally, patients taking blood thinners have similar improvements in pain and functional abilities post-operatively to patients not on blood thinners.

Introduction

Degenerative lumbar spinal changes commonly cause severe back pain and reduced functional capacity.¹ Many patients undergo elective lumbar decompression surgery, with or without spinal fusion as part of the procedure. Because patients are typically older, cardiovascular disease and, subsequently, blood-thinner usage is becoming more prevalent among people undergoing lumbar decompression surgery.² There is little literature on how the use of blood-thinners affects the incidence of bleeding complications, blood transfusions, wound complications, dural tears, neurological complications and venous thromboembolisms (VTEs) in those who undergo surgery. If pre-operative blood-thinner usage correlates with increased levels of operative complications or decreased postoperative patient improvement, this will be an important

discussion point for surgeons conducting and patients undergoing elective lumbar decompression surgery. This study investigates how long-term blood-thinner usage in patients before operation affects surgical and patient-reported outcome measures (PROMs) of elective lumbar microdecompression surgery at a large tertiary hospital.

Methods

Medical notes of patients who had elective posterior lumbar microdecompression surgery with or without spinal fusion, between 1 January 2013 and 1 January 2018, under the same surgeon at University Hospitals Plymouth NHS Trust (Plymouth, UK), were collected and retrospectively analysed. Ethical approval was not required for this study.

Emergency, revision and paediatric cases were excluded owing to lack of follow-up and possible variation in surgical procedures. Patients with at least a 6-month history of pre-operative blood-thinner usage were included. In this time frame, 26 patients on blood-thinners (BT group) fit the criteria. Thirty patients with no pre-operative blood-thinner usage (non-blood-thinner [NBT] group) were then chosen from the remaining eligible candidates through a random number generator. Complication rates and PROMs were analysed and compared between the BT and NBT patient groups. Complication rates and PROMs were then further analysed in $n=22$ patients in the BT group with relevant data, according to whether the patient stopped their blood-thinner use immediately before the operation (BTstop) or continued taking blood thinners intraoperatively (BTnstop).

Demographic data and co-morbidities were recorded and analysed for any confounding. Complications were dural tears, blood transfusions, wound healing complications, VTEs, bleeding complications and neurological complications. The definition of 'excessive blood loss' depended on the surgeon's clinical judgement and quantification. The Visual Analog Score (VAS) for leg and back pain and the Oswestry Disability Index (ODI) for functional ability were the PROMs selected for assessment pre-operatively and postoperatively.

Statistical analysis Statistical analysis was conducted using SPSS 25.0 (IBM, Armonk, NY, USA) and GraphPad (GraphPad Software, La Jolla, CA, USA). A p value <0.05 was considered statistically significant.

Results

Demographic data and co-morbidities are shown in **Table 1**. Twenty out of 26 (76.9%) patients in the BT group were on antiplatelet monotherapy (aspirin or clopidogrel), one out of 26 (3.8%) patients in the BT group was on aspirin and clopidogrel, and five out of 26 (19.2%) were on warfarin.

Table 1. Demographic data and possible confounders.

	BT (n = 26)	NBT (n = 30)	p value (α = 0.05)
Age, years (mean ± SD)	68.69 ± 7.63	56.83 ± 13.85	
Sex (%)			0.224
Female	69.2	53.3	
Male	30.8	46.7	
BMI >25 (%)	69.2	80.0	0.353
Previous smoking history (%)	26.9	43.3	0.201
Hypertension (%)	53.8	16.7	0.003
Diabetes (%)	34.6	6.7	0.009
Osteoporosis or osteopaenia (%)	7.7	6.7	0.882
Osteoarthritis (%)	23.1	13.3	0.342
Cardiac disease history (%)	73.1	6.7	0.000
History of cancer (%)	0.0	6.7	0.180
Previous lumbar surgery (%)	3.8	6.7	0.640
Psychiatric illness (%)	11.5	16.7	0.584
Neurological or cerebrovascular disease history (%)	44.0	23.3	0.145
Use of immunosuppressant medications (%)	15.4	10.0	0.543
Use of intraoperative haemostatic agents (%)	19.2	30.0	0.353
Length of hospital stay (%)			0.271
<1 day	42.3	41.4	
1–5 days	42.3	55.2	
>5 days	15.4	3.4	
Underwent microdecompression surgery with spinal fusion (%)	42.3	50.0	0.565
Number of spinal levels operated upon (%)			0.983
1 level	73.1	73.3	
2 level	26.9	26.7	
Two patient follow ups (%)	42.3	43.3	0.938
Time to final follow up, months (mean ± SD)	4.27 ± 2.79	4.22 ± 2.27	

Table 1 shows the complication rates for the BT and NBT patient groups. Although there was a difference in the proportion of patients with hypertension, diabetes or history of cardiac disease (**Table 1**) between the two groups, these confounders would be clinically expected in the BT group.

Two (7.7%) patients in the BT group had excessive intraoperative bleeding, whilst no cases of excessive bleeding were observed in the NBT patient group (**Figure 1a**). During surgery, there were no incidences of VTE complications in both the NBT and BT groups (data not shown). A total of 7.7% of the BT and 10.0% of the NBT group had

blood transfusions during surgery (**Figure 1b**). One (3.8%) patient in the BT group had prolonged oozing as a wound complication (**Figure 1c**). In contrast, two (6.7%) NBT patients had wound healing complications; one had a superficial wound infection and the other had excessive swelling (**Figure 1c**). One (3.8%) patient in the BT group and three (10%) in the NBT group had dural tears, but no cerebrospinal fluid (CSF) leakage (**Figure 1d**). Five (19.2%) patients in the BT group had neurological complications (**Figure 1e**), none were linked to dural tears. In comparison, nine (30.0%) of patients in the NBT group developed neurological complications (**Figure 1e**); one had a headache after a dural tear.

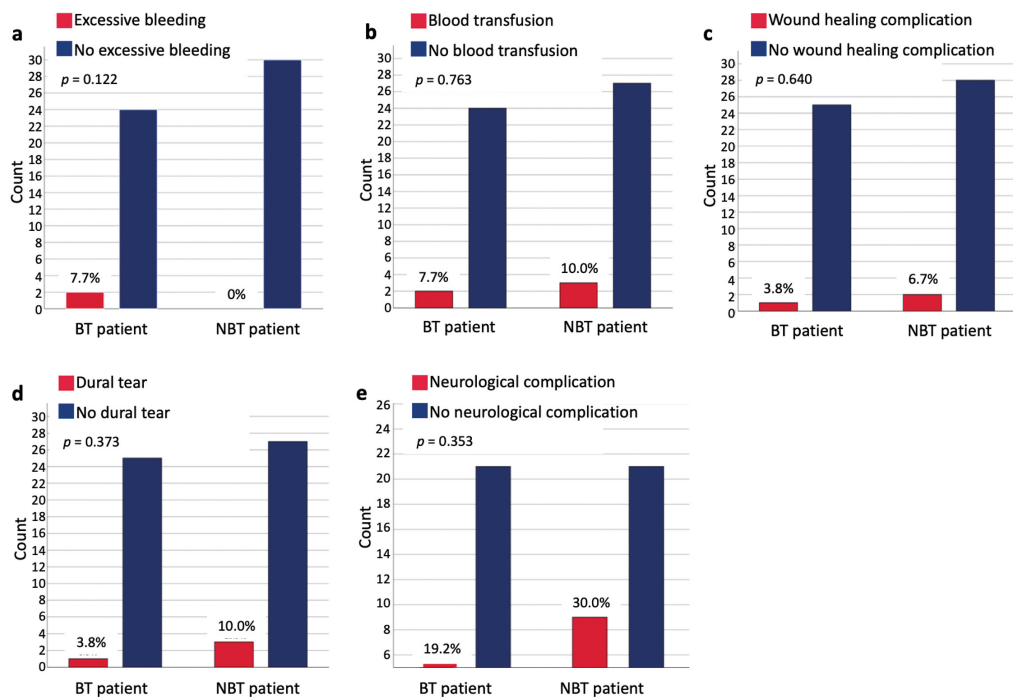


Figure 1. Complication rates for the BT versus NBT group. Rates of bleeding complications (a), blood transfusions (b), wound healing complications (c), dural tears (d) and neurological complications (e) in patients in the BT and NBT group who underwent elective lumbar microdecompression surgery.

Both NBT and BT groups had statistically significant improvements in their VAS for leg (VASleg; $p < 0.0001$ for NBT; $p = 0.0001$ for BT; data not shown) and back (VASback; $p < 0.0001$ for both groups; data not shown), and in ODI scores ($p < 0.0001$ for NBT; $p = 0.0105$ for BT; data not shown). Seven of 22 (31.8%) patients in the BT group were confirmed to not have stopped their blood-thinner use pre-operatively (BTnstop group), while 15 (68.2%) did stop (BTstop group). A greater incidence of excessive intraoperative blood loss in

BTnstop patients was statistically significant ($p = 0.030$; **Figure 2a**). Neither the BTstop nor BTnstop group had any VTE complications (data not shown). In addition, there were no statistically significant differences in the rate of intraoperative transfusions ($p = 0.563$; **Figure 2b**), wound complications ($p = 0.484$; **Figure 2c**), dural tears ($p = 0.484$; **Figure 2d**) or neurological complications ($p = 0.519$; **Figure 2e**) between patients in the BTstop and BTnstop groups.

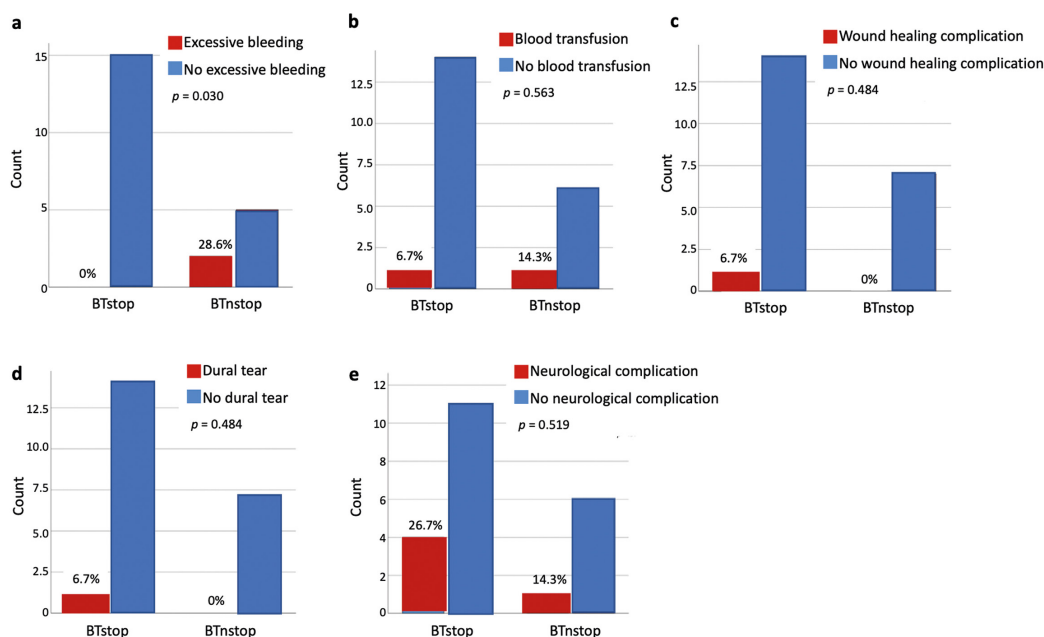


Figure 2. Complication rates for the BTstop versus BTnstop group. Rates of bleeding complications (a), blood transfusions (b), wound complications (c), dural tears (d) and neurological complications (e) in patients in the BTstop and BTnstop groups who underwent elective lumbar microdecompression surgery.

Discussion

While spinal surgery itself can result in nerve injury, this study focussed on neurological complications secondary to incidental durotomies or bleeding complications, specifically spinal haematomas. Dural tears must be checked for CSF leakage.³ Unrepaired tears cause minor symptoms, such as postural headaches, or progress into concerning conditions, such as CSF fistulas or epidural abscesses.³ Furthermore, multiple case reports suggest that incidental durotomies in spinal surgery may contribute to the formation of spinal haematomas.^{4,5} A subdural or epidural spinal haematoma is a severe bleeding complication because it causes spinal-cord compression.⁶ Patients present with sudden severe pain, sensory deficits, motor

weakness and bladder/bowel dysfunction; if the haematoma is not decompressed quickly, these symptoms will become irreversible.⁶ Researchers have suggested that patients on blood-thinners undergoing orthopaedic procedures are vulnerable to developing sudden spinal hematomas.⁵ However, in this study, patients in the BT group did not have a higher incidence of dural tears, haematomas or neurological complications as compared with those in the NBT group. This may be because the surgeon conducting the procedure is a widely experienced consultant in lumbar decompression surgery whose expertise may have greatly reduced the risk of an accidental durotomy, as compared with a training surgeon. Additionally, none of the dural tears had CSF leakage, which is associated with a higher incidence of neurological or bleeding complications as compared with dural tears without CSF leakage.⁵

Blood transfusions are associated with wound healing complications due to their immunomodulating effects.⁷ Thus, haematomas and excessive intraoperative blood loss can, indirectly, contribute to the formation of surgical-site infections and other wound-healing problems. However, current literature on intraoperative aspirin (the commonest antiplatelet therapy) suggests that increased intraoperative blood loss does not necessarily correlate with increased morbidity. A randomised controlled trial (RCT) demonstrated a 7.2% absolute risk reduction for postoperative VTE following major noncardiac surgery with intraoperative aspirin use.⁸ In spinal surgery, Goes et al found that intraoperative aspirin use did not increase bleeding risk or blood transfusion requirements.² Moreover, it was found that, even though intraoperative aspirin use increased bleeding risk by 50%, this did not correlate with increased patient mortality or morbidity.⁸

In terms of PROMS, VAS and ODI are frequently used together because pain severity strongly correlates with functional ability.^{9,10} An equivalence RCT found that PROMs become less reliable after 12 months.¹¹ For longer follow-up, objective measures, such as reoperation rates, should be considered.¹¹

The findings of this study align with those from previous studies. Most patients in the BT group were taking aspirin, and no significant differences were observed in any of the complication rates assessed between the BT and NBT groups, despite increased intraoperative blood loss in BTnstop patients. Additionally, long-term blood-thinner usage did not correlate with reduced postoperative improvement. This study is only a small retrospective investigation of one medical centre. In addition, it did not consider blood-thinner dosages or the effects of other blood thinners, such as heparinoids. Hence, larger prospective studies investigating all blood-thinners and elective lumbar microdecompression surgical outcomes are needed to further determine how safe and satisfactory this operation is for patients on blood-thinners.

Conclusion This study investigated whether patients with a history of long-term blood-thinner usage prior to operation were at more risk of complications of lumbar microdecompression surgery as compared with patients who were not taking blood thinners. This study also investigated whether postoperative PROMs regarding pain and functional ability were affected by long-term blood-thinner usage. The findings show that patients in the BT group were not at higher risk for VTEs, dural tears, neurological complications, or wound complications, including surgical site infections. Patients in the BT group who continued their blood-thinner perioperatively had more intraoperative blood loss, but there was still no statistically significant difference in bleeding complications, including epidural haematomas or intraoperative blood transfusions between the BT and NBT group. Both patients in the BT and NBT group had improvements of the same magnitude in postoperative pain and function. Future randomised, large prospective studies should further investigate the relationship between long-term blood-thinner usage and surgical outcomes.

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Contribution statement Madhumita Kolluri is responsible for the integrity of the work as a whole.

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