Thromboprophylaxis and Peripheral Nerve Blocks in Patients Undergoing Joint Arthroplasty

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Abstract: This study was designed to assess the risk of hematoma related to the combination of peripheral nerve blocks and thromboprophylaxis. A total of 3588 patients undergoing joint arthroplasty were included. Blocks performed included continuous lumbar plexus, continuous femoral, and continuous or single sciatic. The perineural catheters were removed on postoperative days 2 or 3. A total of 6935 blocks were performed in patients receiving warfarin (50.0%), fondaparinux (12.8%), deltaparin (11.6%), enoxaparin (1.8%), and aspirin (23.8%). In this patient population, no perineural hematoma was recorded. Our data provide evidence that continuous/single peripheral nerve blocks can be safely performed before thromboprophylaxis initiation, and perineural catheters can be safely removed while the patient is receiving thromboprophylaxis and/or aspirin.
Key words: anticoagulants, thromboprophylaxis, joint arthroplasty, peripheral nerve blocks.
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The use of regional anesthesia techniques in the anticoagulated patient has been the object of significant debate. Although guidelines have been established for the use of neuroaxial blocks in anticoagulated patients [1,2], no guidelines exist for the use of peripheral nerve blocks in anticoagulated patients. However, an increasing number of patients undergoing major orthopedic surgery benefit from the use of peripheral nerve blocks for anesthesia and postoperative analgesia [3-5]. Based on anecdotal reports, several authors have suggested that the American Society of Regional Anesthesia (ASRA) guidelines for anticoagulant and neuroaxial blocks be applied for the placement and removal of "deep" blocks in anticoagulated patients without consideration for the anticoagulant indications [6]. Case reports described hematoma after either the performance of a single block [7-9] or the removal of perineural catheters in [8,10] mostly for a therapeutic indication rather than for thromboprophylaxis. In these conditions, the recommendations for either the performance of single block or placement and/or removal of perineural catheters in patients receiving thromboprophylaxis remain unknown, especially with respect to the risk of bleeding. This study was designed to assess the risk of perineural bleeding associated with the use of peripheral nerve blocks in patients undergoing major orthopedic surgery

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Table 1. Distribution of Patients According to the Type of Thromboprophylaxis and the Type of Blocks Performed

	No. of Patients, n (%)	Anticoagulant	No. of Blocks, n (%)	Nerve Block	No. of Blocks
	856 (23.8)	Aspirin	1678 (24.2)	Sciatic S	636
				Sciatic C	182
				Lumbar P S	1
				Femoral C	184
				Lumbar P C	675
	418 (11.6)	Deltaparin	800 (11.6)	Sciatic S	132
				Sciatic C	251
				Femoral C	257
				Lumbar P C	160
	63 (1.8)	Enoxaparin	122 (1.8)	Sciatic S	20
				Sciatic C	38
				Femoral C	41
				Lumbar P C	23
	458 (12.8)	Fondaparinux	877 (12.7)	Sciatic S	168
				Sciatic C	251
				Lumbar P S	0
				Femoral C	265
				Lumbar P C	193
	1793 (50.0)	Warfarin	3458 (49.8)	Sciatic S	651
				Sciatic C	1009
				Lumbar P S	3
				Femoral C	1043
				Lumbar P C	753
Total	3588 (100)				6935

Lumbar P indicates lumbar plexus; S, single; C, continuous.

and requiring postoperative thromboprophylaxis for the prevention of deep venous thrombosis (DVT) and/or pulmonary emboli (PE).

Method

Patients undergoing knee and hip arthroplasty surgery between July 2002 and November 30, 2005, at UPMC Shadyside Hospital in Pittsburgh and requiring both peripheral nerve blocks and thromboprophylaxis (prevention of DVT and PE) were identified using appropriate CPT codes, peripheral nerve block codes, and the pharmacy charges database, respectively. Although, it is established that the use of 81 mg of aspirin does not increase the risk of regional anesthesia [1] and because there are more surgeons using 325 mg, BID, aspirin for thromboprophylaxis after joint arthroplasty, patients receiving 325 mg, BID, of aspirin and peripheral nerve blocks were also included in this retrospective analysis. We excluded from this analysis patients who underwent orthopedic procedures who received either thromboprophylaxis or peripheral nerve blocks and patients who received anticoagulants for therapeutic indications such as arrhythmia, prosthetic valves, and the treatment of DVT and pulmonary embolism. For each patient, the type of peripheral nerve block performed, the type of thromboprophylaxis, the dose, and the date of initiation and duration of therapy along with any bleeding complication were recorded prospectively. All peripheral nerve blocks were performed before surgery. A continuous lumbar plexus and a single parasacral block were performed for the postoperative pain management after a total hip arthroplasty, whereas continuous femoral and continuous gluteal blocks were performed for patients undergoing total knee arthroplasty. The peripheral nerve blocks performed included continuous or single lumbar plexus, femoral and sciatic blocks. Lumbar plexus and sciatic catheters were removed on postoperative day 2, whereas femoral catheters were removed on postoperative day 3. The removal of each perineural catheter was done by the nurse assigned to the care of the patient without any consideration for the type of anticoagulant and the time of its administration. After the removal of the perineural catheter, patients were monitored for perineural hematoma (pain at the site, morphologic changes, neurological deficits, and computed tomography [CT] scan, when necessary).

Results

During the study period, a total of 3588 patients (50.2% knee arthroplasty and 49.8% hip

Table 2. Distribution of Patients According to the Type of Thromboprophylaxis and the Type of Surgery

	No. of Patients, (%)	Surgery	No. of Patients
Aspirin	856 (23.8)	THA	673
		TKA	183
Deltaparin	418 (11.7)	THA	160
		TKA	258
Enoxaparin	63 (1.8)	THA	23
		TKA	40
Fondaparinux	458 (12.8)	THA	193
		TKA	265
Warfarin	1793 (49.9)	THA	752
		TKA	1041
Total	3588		3588

THA indicates total hip arthroplasty; TKA, total knee arthroplasty.

arthroplasty) met inclusion criteria. A total of 6935 blocks were performed, including 1610 single blocks (1607 sciatic and 3 lumbar plexus) and 5325 continuous nerve blocks (1731 sciatic, 1790 femoral, and 1804 lumbar plexus). Table 1 represents the distribution of patients according to the type of blocks. The anticoagulants administered included warfarin (50.0%), aspirin (23.8%), fondaparinux (12.8%), deltaparin (11.6%), and enoxaparin (1.8%). Table 2 represents the distribution of patients according to the type of thromboprophylaxis and surgery. Aspirin therapy was initiated mostly on the day of the evening of surgery, whereas warfarin was initiated either on the day of or the morning after surgery. In contrast, in most patients, low-molecular-weight heparin (fondaparinux, deltaparin, and enoxiparin) was initiated the morning after surgery. Table 3 presents the distribution of patients according to the initiation of thromboprophylaxis therapy. Aspirin and fondaparinux were administered at a dose of 325 mg, BID PO, and 2.5 mg, SC, respectively. Most patients who received deltaparin, warfarin, and enoxiparin received 5000 units, SC; 5 to 7.5 mg, PO; and 30 mg, SC, respectively. Table 4 presents the distribution of patients according to the dose of anticoagulant administered for thromboprophylaxis therapy. In this patient population, no perineural hematoma was recorded. In 2 cases, a CT was performed to eliminate the possibility of a retroperitoneal hematoma because of delays in motor function recovery after a total hip arthroplasty. In both cases, the CT was negative for hematoma.

Table 3. Initiation of the Thromboprophylaxis According to the Day of Surgery Used as Reference (Day 0)

Anticoagulant	No. of Patients	Days of Initiation of Thromboprophylaxis	No. of Patients
Aspirin	856	−1	2
		0	691
		1	156
		2	7
Deltaparin	418	−1	3
		0	17
		1	367
		2	28
		3	1
		4	2
Enoxaparin	63	−1	2
		0	4
		1	54
		2	3
Fondaparinux	458	−4	1
		−1	2
		0	26
		1	398
		2	27
		3	3
		4	1
Warfarin	1793	−1	2
		0	884
		1	848
		2	45
		3	12
		4	1
		5	1
Total	3588		3588

Table 4. Distribution of Patients According to the Type and Dose of Anticoagulants

	No. of Patients, n (%)	Dose	No. of Patients, n (%)
Aspirin	856 (23.8)	325 mg TAB, BID	856 (23.8)
Deltaparin	418 (11.6)	2500 U INJ, SC	41 (1.1)
		5000 U INJ, SC	376 (10.5)
		10,000 U INJ, SC	1 (0.0)
Enoxaparin	63 (1.8)	30 mg INJ, SC	44 (1.2)
		40 mg INJ, SC	6 (0.2)
		60 mg INJ, SC	12 (0.3)
		80 mg INJ, SC	1 (0.0)
Fondaparinux	458 (12.8)	2.5 mg INJ, SC	458 (12.8)
Warfarin	1793 (50.0)	1 mg TAB	90 (2.5)
		2 mg TAB	25 (0.7)
		2.5 mg TAB	16 (0.4)
		3 mg TAB	13 (0.4)
		4 mg TAB	7 (0.2)
		5 mg TAB	630 (17.6)
		7.5 mg TAB	824 (22.9)
		10 mg TAB	188 (5.2)
Total	3588		3588

INJ indicates injection; SC, subcutaneous; TAB, tablet.

Discussion

Our data provide evidence that continuous/single peripheral nerve blocks can be safely performed before the initiation of thromboprophylaxis aspirin and that the perineural catheters can be safely removed while the patient is receiving thromboprophylaxis using low-molecular-weight heparin, warfarin, and aspirin. This is the first report documenting that the combination of peripheral nerve blocks, either single or continuous, and thromboprophylaxis therapy initiated either on the day of or the next day after surgery does not increase the risk of perineural hematoma in patients undergoing joint arthroplasty. Recently, Buckenmaier et al [11] also concluded that continuous peripheral nerve block in combat casualties receiving low-molecular-weight heparin was safe.

Thromboprophylaxis has been shown to significantly decrease the risk of DVT and PE, and its use has been recommended in patients undergoing total joint arthroplasty, especially during the immediate operative period when patients are at the greatest risk of DVT and PE [12-16]. The use of peripheral nerve blocks, especially continuous techniques, has also been shown to provide effective postoperative pain control after joint arthroplasty [3-5]. Additional advantages of the use of peripheral nerve blocks include the decrease in opioid consumption and associated side effects, as well as the reduction of the hospital length of stay [3]. Therefore, optimum postoperative management of patients undergoing joint arthroplasty or hip fracture should include the use of both techniques, especially if it can be demonstrated that their coadministration is safe. Our data demonstrate that it is safe to perform peripheral nerve blocks in patients whose anticoagulant therapy is being initiated either on the evening or the next day of surgery and that it is also safe to remove the perineural catheters while receiving thromboprophylaxis without consideration for the type of anticoagulants and the dose regimen. Thus, 379 lumbar plexus catheters were removed without precaution in patients also receiving low-molecular-weight heparin for thromboprophylaxis.

Because of the increased risk of spinal hematoma with the combination of low-molecular-weight heparin and the placement and removal of epidural, today, most patients undergoing total joint arthroplasty who benefited from the placement of an epidural for anesthesia have their epidural removed either immediately after surgery or the next day before thromboprophylaxis initiation [5]. Because it is established that an effective pain management accelerates functional recovery in patients undergoing total joint arthroplasty, it is clear that the removal of the epidural catheter before initiation of physical therapy deprives the patient of an optimal postoperative pain control at the time when epidural therapy is much needed. In this regard, the peripheral nerve block represents an interesting alternative to the established benefit of epidural analgesia, especially when considering that peripheral nerve blocks are associated with less side effects [17].

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