Intraoperative ketorolac use does not increase bleeding complications in breast surgery

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Introduction

- We have previously shown that opioid-minimizing Breast Surgery ERAS (Enhanced Recovery After Surgery) Protocols eliminate the reflex narcotic prescription at discharge while providing superior pain control in lumpectomy and mastectomy patients.
- We sought to determine if the use of intraoperative ketorolac increases the risk of bleeding complications in breast surgery.

Methods

- Study: Subset analysis of prospective, controlled cohort study of patients undergoing lumpectomy and mastectomy at a single institution
- Exclusion criteria: Immediate reconstruction
- Study arms:
    - Patients who received intraoperative ketorolac
    - Patients who did not received intraoperative ketorolac
- Outcomes:
    - Primary: Bleeding complications (bruising, hematoma)
    - Secondary: Seroma, infection, dehiscence
- Analysis plan: Complications compared using Fisher's exact test or t-test, and further analyzed by surgical modality

Results

Table 1. Patients Demographics and Treatment Characteristics

Characteristics (%)	No Ketorolac (n=99)	Ketorolac (n=115)	p-value
Female	97 (98)	111 (96.5)	0.688
Age	59.8 (20-94)	55.9 (16-88)	0.058
Any comorbidity	60 (60.6)	59 (51.3)	0.214
Cardiovascular	50 (50.5)	46 (40.0)	0.132
Diabetes	16 (16.2)	19 (16.5)	1.000
Obesity	9 (9.1)	15 (13.0)	0.393
Never-smoker	71 (71.7)	90 (78.3)	0.341
Current or past smoker	28 (28.3)	25 (21.7)	
Lumpectomy	59 (59.6)	98 (85.2)	<0.001
Mastectomy	40 (40.4)	17 (14.8)	
Proportion with malignancy:			
Total	76 (76.8)	61 (53.0)	<0.001
Lumpectomy	36 (61.0)	46 (46.9)	0.101
Mastectomy	40 (100)	17 (100)	1.000
Bilateral	8 (8.1)	8 (8.1)	0.883
No axillary surgery	37 (37.4)	70 (60.9)	
Sentinel node biopsy	46 (46.5)	40 (34.8)	<0.001
Axillary dissection	16 (16.2)	5 (4.4)	
Perioperative management:			
Preop acetaminophen	15 (15.2)	90 (78.3)	<0.001
Preop gabapentin	15 (15.2)	87 (75.7)	<0.001
Liposomal bupivacaine	29 (29.3)	93 (80.9)	<0.001

Results

Table 2. Complications Among All Patients

	No Ketorolac	Ketorolac	p-value
Any Complication	7 (7.1)	7 (6.1)	0.789
Any Major Complication[a]	6 (6.1)	4 (3.5)	0.519
Minor Complication	1 (1.0)	3 (2.6)	0.626
Seroma	2 (2.0)	1 (0.9)	0.597
Infection	1 (1.0)	0 (0)	0.463
Dehiscence	1 (1.0)	0 (0)	0.463
Bleeding Complication			
Any (Bruising or Hematoma)	2 (2.0)	3 (2.6)	1.000
Bruising	0 (0)	2 (1.7)	0.501
Hematoma	2 (2.0)	1 (0.9)	0.597

[a]Major complication: seroma, infection, dehiscence, bleeding

Table 3. Complications Among Lumpectomy Patients

	No Ketorolac	Ketorolac	p-value
Any Complication	1 (1.7)	4 (4.1)	0.651
Any Major Complication[a]	0 (0)	1 (1.0)	1.000
Minor Complication	1 (1.7)	3 (3.1)	1.000
Seroma	0 (0)	0 (0)	n/a
Infection	0 (0)	0 (0)	n/a
Dehiscence	0 (0)	0 (0)	n/a
Bleeding Complication			
Any (Bruising or Hematoma)	0 (0)	1 (1.0)	1.000
Bruising	0 (0)	1 (1.0)	1.000
Hematoma	0 (0)	0 (0)	n/a

[a]Major complication: seroma, infection, dehiscence, bleeding

Table 4. Complications Among Mastectomy Patients

	No Ketorolac	Ketorolac	p-value
Any Complication	6 (5.0)	3 (17.7)	1.000
Any Major Complication[a]	6 (15.0)	3 (17.7)	1.000
Minor Complication	0 (0)	0 (0)	n/a
Seroma	2 (5.0)	1 (2.5)	1.000
Infection	1 (2.5)	0 (0)	1.000
Dehiscence	1 (2.5)	0 (0)	1.000
Bleeding Complication			
Any (Bruising or Hematoma)	2 (5.0)	2 (11.8)	0.575
Bruising	0 (0)	1 (5.9)	0.298
Hematoma	2 (5.0)	1 (5.9)	1.000

[a]Major complication: seroma, infection, dehiscence, bleeding

Results

Figure 1. Treatment Groups and Hematoma Rates
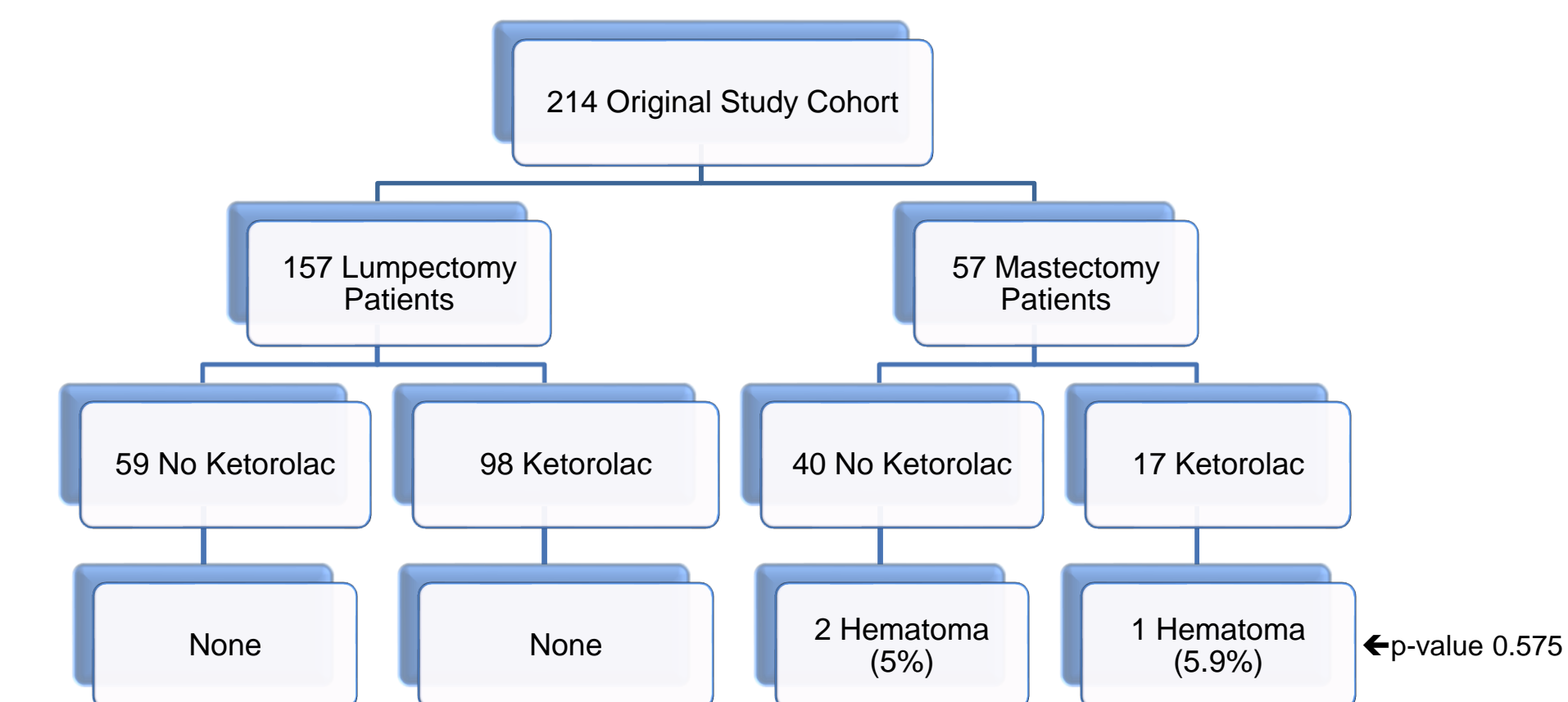
Important Results:
- When analyzed overall and divided by surgical modality, rates of any bleeding complications were similar (p=1.00)
- All hematomas required transfusion but were managed conservatively.
- Ketorolac dose (15 vs. 30 mg) did not correlate with bleeding risk.

Discussion

- Perioperative NSAIDs attenuate inflammatory response during and after surgery and may have anti-neoplastic effects, potentially improving oncologic outcomes.
- Intraoperative ketorolac does not increase risk of bleeding complications in breast surgery and should be incorporated into the perioperative pain management plan, especially in patients with breast cancer.

References

1. Rojas K, Manasseh DM, Flom PL, Agbroko S, Bilbro N, Andaz C, Borgen PI. A pilot study of a breast surgery Enhanced Recovery After Surgery (ERAS) protocol to eliminate narcotic prescription at discharge. Breast Cancer Res Treat. 2018; 171(3):621-626
2. Gobbe RM, Hoang HL, Kachniarz B, Orgill DP. Ketorolac does not increase perioperative bleeding: a meta-analysis of randomized controlled trials. Plast Reconstr Surg. 2014; 133(3):741-755
3. Retsky M, Demicheli R, Hrushesky W, et al. Reduction of breast cancer relapses with perioperative non-steroidal anti-inflammatory drugs: new findings and review. Curr Med Chem. 2013; 20(33):4163-4176