Original Article ISSN (O):2395-2822; ISSN (P):2395-2814

Interscalene Brachial Plexus Block With and Without Dexamethasone: A comparative Study.

Jayesh Ingle[1], Naresh W Paliwal[2], Abhishek Bhadage[3]

[1]Assistant Professor, Department of Anesthesiology Dr. Panjabrao Deshmukh Memorial Medical College, Amravati (MS)- India
[2]Associate Professor, Department of Anesthesiology Dr. Panjabrao Deshmukh Memorial Medical College, Amravati (MS)- India
[3]Junior Resident, Department of Anesthesiology Dr. Panjabrao Deshmukh Memorial Medical College, Amravati (MS)- India

Received: March 2019
Accepted: March 2019

ABSTRACT

Background: Interscalene block is commonly used for anesthesia and analgesia in patients undergoing surgeries of shoulder and upper arm. Combination of lignocaine and bupivacaine is commonly used for this purpose. Addition of dexamethasone to local anesthetic drugs is reported to cause rapid onset and enhance the duration of anesthesia and analgesia. We conducted this study to compare the analgesic effect in interscalene block with local anesthetic versus local anesthetic and steroid. **Methods:** This was a prospective comparative study conducted in the department of anesthesiology of a tertiary care medical college situated in an urban area. In this study total 120 patients undergoing upper limb surgery under interscalene block were included on the basis of a predefined inclusion and exclusion criteria. Out of these 120 patients 60 patients received lignocaine, adrenaline, bupivacaine and dexamethasone (Group A) whereas remaining 60 patients were given lignocaine, adrenalin, bupivacaine and distilled water (Group B). The comparison of onset of analgesia, onset and duration of motor blockade as well as onset and duration of sensory blockade was compared in both the groups. For statistical analysis SSPE 21.0 software was used and P value less than 0.05 was taken as statistically significant. **Results:** Majority of the studied cases belonged to the age group of 21-30 years (24.17%) followed by 31-40 years (23.33%). The mean age of patients in both the group was found to be comparable with no statistically significant difference between mean age of both the groups (P>0.05). The mean time for onset of analgesia in Group A and Group B was found to be 7.43 +/- 1.65 and 6.01+/- 1.55. The difference was found to be statistically significant (P<0.0001). The duration of sensory and motor blockade was found to be 14.6+/-12.5 and 11.93+/- 1.48 in group A. where as in group B it was found to be 11.8+/-0.8614 and 8.85 +/- 1.15 respectively. Onset of sensory blockade was found to be 7.01 +/-2.12 and 9.09 +/- 3.08 in group A and group B respectively. The difference was found to be statistically significant for duration of sensory and motor blockade. Onset of motor blockade was found to be comparable in both the groups with no statistically significant difference (P>0.05). **Conclusion:** Addition of dexamethasone to local anesthetic agent for interscalene block is associated with rapid onset of analgesia and a prolonged duration of motor and sensory blockade.

Keywords: Interscalene block, Dexamethasone, Local Anesthetic, Duration of analgesia.

INTRODUCTION

One of the most important part of management of patients undergoing orthopedic surgeries is management of pain. Management of pain during and after shoulder and arm surgeries is one of the biggest challenges faced by anesthetists.[1] One of the important methods of providing pain relief in patients undergoing shoulder and arm surgeries include Interscalene nerve block (ISB) which consist of infiltration of local anesthetic agent around the roots and trunks of the brachial plexus. The procedure was first described by Alon Winnie in 1970.[2] The procedure nowadays is performed under ultrasound guidance. Under ultrasound guidance direct visualization and infiltration of local anesthetic drugs around brachial plexus roots and trunks is associated with more precise block. This technique is commonly used for anesthesia and analgesia in patients undergoing surgeries of shoulder and upper arm. The advantage of this technique includes a quick recovery and shorter hospital stay.[3] Moreover, in many studies patients undergoing upper limb surgeries Interscalene nerve block were found to have less requirement of postoperative analgesics. It must be noted that Interscalene nerve block is not effective in surgeries involving territories supplied by Ulnar nerve and hence can't be utilized in surgeries involving hands and forearms and hence other methods of providing satisfactory analgesia are needed in patients undergoing forearm and hand surgeries.[4] More recently it has been reported to be effective in patients undergoing shoulder arthroscopy. There are many randomized controlled trials which have

Name & Address of Corresponding Author
Dr Naresh W Paliwal
Associate Professor
Department of Anesthesiology
Dr. Panjabrao Deshmukh Memorial Medical College, Amravati (MS)- India

concluded that even total shoulder arthroplasty can be effectively done under interscalene block though larger studies are still needed to conclusively demonstrate its effectiveness in total shoulder arthroplasty.[5]

Various local anesthetics which are used for ISB include Bupivacaine, Ropivacaine and mepivacaine. Long acting drugs such as bupivacaine and ropivacaine are usually preferred due to their ability to provide postoperative analgesia for up to 12-24 hours.[6] When ISB is used as primary as primary anesthetic technique for shoulder and arm surgeries quick recovery is expected and need for post anesthetic care unit admissions is obviated.[7] On the other hand, use of ISB as primary and sole anesthetic technique may be associated with analgesia which may not last for more than 24 hours. For this purpose, various adjuvants such as adrenalin, clonidine, ketamine and opioids have been tried bay many researchers.[8] Role of dexamethasone in prolonging analgesic effects of drugs is being increasingly studied by researchers with encouraging results in various preclinical and clinical studies.[9] The mechanism by which dexamethasone prolongs the duration of local anesthetic drug is not exactly known but since steroids are known to cause vasoconstriction its postulated that decreased rate of absorption from the infiltration site may be one of the important mechanisms by which steroids may increase the duration of analgesia.[10] Another important mechanism by which steroid may prolong the duration of analgesia may be due to its action on inhibitory potassium channels thereby decreasing the activity of nociceptive C-Fibers. Action on inhibitory Potassium channels appears to be widely accepted theory by which steroid (dexamethasone) appears to be prolonging the action of local anesthetic drugs.[11] We conducted this study to compare the analgesic effect in interscalene block with local anesthetic versus local anesthetic and steroid.

MATERIALS AND METHODS

This was a prospective comparative study in which patients undergoing shoulder and upper arm surgeries under interscalene block were included on the basis of a predefined inclusion and exclusion criteria. The study was conducted in the department of anesthesiology of a tertiary care medical college situated in an urban area. Patients of either sex and in between the age group of 18-70 years and belonging to ASA grade 1 and 2 were included in this study. Sample size was calculated by using open epi software. Considering the mean difference between motor and sensory block sample size came to be 60 for each group. A Prevalidated pretested semi structured questionnaire was used for collection of data. A total of 120 patients were included in this study. Out of these 120 patients 60 patients received Lignocaine with adrenaline 20ml (12ml Lignoadrenaline plus 08 ml distilled water) and 0.5% bupivacaine 20ml (12ml Bupivacaine plus 8 ml distilled water) along with Dexamethasone 08 mg (Group A). While remaining 60 patients received Lignocaine along with adrenaline 20ml (12ml Lignoadrenaline plus 08 ml distilled water) and 0.5% bupivacaine 20ml (12ml Bupivacaine plus 8 ml distilled water) (Group B). Demographic details such as age, gender and socioeconomic status was noted. Investigations such as complete blood count, chest X-ray, Blood urea, serum creatinine and random blood sugar levels were done in all cases. Coagulation profiler and ECG was also done in all the cases. Any significant illness in past and history of allergy to any drug was asked for and noted down. Onset of Analgesia, Onset and duration of sensory and motor blockade was also noted down in a preformed proforma. Onset of Analgesia was assessed by pin prick method. Whereas Motor blockade was assessed by asking patient to lift hand from shoulder and duration of motor blockade was assessed by recovery of motor power. Duration of Analgesia was assessed by Visual Analogue Scale.

Procedure for interscalene block:

After proper positioning of the patient the skin is disinfected properly. The 3 landmarks clavicle, clavicular head of sternomastoid and external jugular vein are identified on the affected side. After identifying the landmarks, the anterior and middle Scalene muscles are palpated with all aseptic precautions. The skin was anesthetized using local anesthetic drug given subcutaneously and needle is then inserted posterior to the internal jugular vein 3 cm above clavicle and then it is advanced until it reached brachial plexus. The local anesthetic is then injected with intermittent aspiration to be sure that the drug is not being inadvertently injected intravenously.

Inclusion Criteria:

1. Patients undergoing shoulder and upper arm surgeries under interscalene block.
2. Ready to give written informed consent to be part of study.
3. Age 18-70 years.
4. ASA grade 1 and 2.

Exclusion Criteria:

1. Those who refused consent.
2. ASA grade 3 and 4
3. Any bleeding disorders and patient on anticoagulant.
4. Neuropathy in the arm in which surgery is planned.
5. Morbid Obesity.
6. History of allergy to local anesthetic
7. Pregnant women.
8. Age less than 18 years or above 70 years.

RESULTS

In this prospective comparative study 120 patients undergoing shoulder and upper arm surgeries under interscalene block were included. The patients were divided into 2 groups on the basis of whether or not they received dexamethasone along with local anesthetic drug used for interscalene block. The distribution of the basis of gender showed that out of 120 studied cases there were 91 (75.83%) males and 29 (24.17%) females with a MF ratio of 1:0.31.

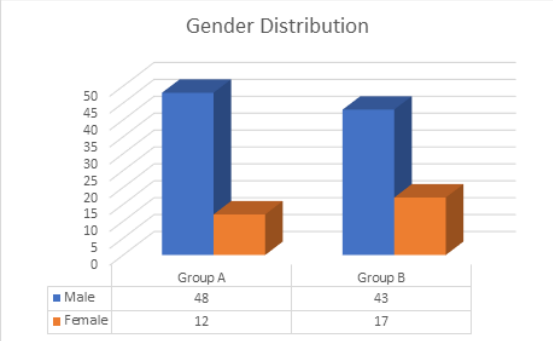

Figure 1: Gender Distribution of the studied cases.

The analysis of age distribution of both the groups showed that the most common affected age group in group A was between 31-40 years (25%) whereas in Group B the most common affected age group was found to be 21-30 years (28.33%). The mean age of Group A and B was found to be 40.30+/- 13.75 and 38.46 +/- 15.13 years respectively. The mean age was found to be comparable and there was no statistically significant difference in the mean age of both the groups.

Table 1: Age groups of the studied cases.

Age Groups	Group A		Group B	
	No of patients	Percentage	No of patients	Percentage
Up to 20 years	7	11.67%	5	8.33%
21-30 years	12	20.00%	17	28.33%
31-40 years	15	25.00%	13	21.67%
41-50 years	12	20.00%	8	13.33%
51-60 years	8	13.33%	11	18.33%
61-70 years	6	10.00%	6	10.00%
Total	60	100%	60	100%
Mean Age	40.30+/- 13.75		38.46 +/- 15.13	
P = 0.487 (Not significant)				

The analysis of the cases on the basis of ASA grades showed that in group A there were 38 patients belonging to ASA I where as 22 patients belonged to ASA II. In group B 32 patients belonged to ASA I and 28 patients belonged to ASA II.

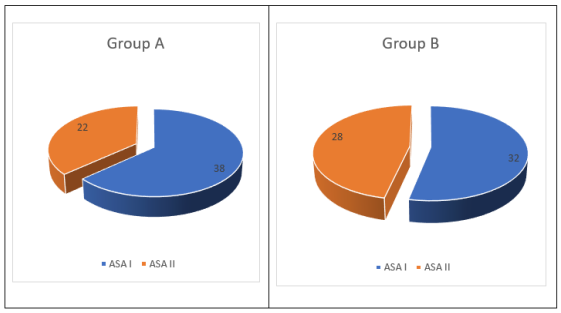

Figure 2: ASA grades of the studied cases.

The analysis of onset of analgesia in both the groups showed that in Group A the onset of analgesia was at 7.43 +/- 1.65 minutes whereas in Group B the onset of analgesia was 6.01 +/- 1.55 minutes. Statistical analysis showed that patients in Group B (No Dexamethasone) had a quicker onset of analgesic action as compared to Group A (Dexamethasone). The difference was found to be statistically significant (P<0.0001).

Table 2: Comparison of onset of analgesia in both the groups.

	Onset of Analgesia (Minutes)	Std Deviation
Group A	7.43	1.65
Group B	6.01	1.55
95% CI	-1.9988 to -0.8412	
t	-4.85	
P	< 0.0001 (Significant)	

The analysis of onset of sensory block in both the groups showed that in Group A the onset of sensory block was at 7.01 +/- 2.12 minutes whereas in Group B the onset of sensory block was 9.09 +/- 3.08 minutes. Statistical analysis showed that patients in Group A (Dexamethasone) had a quicker onset of sensory block as compared to Group B (No Dexamethasone). The difference was found to be statistically significant (P<0.0001)

Table 3: Comparison of onset of sensory block in both the groups.

	Onset of Sensory block (Minutes)	Std Deviation
Group A	7.01	2.12
Group B	9.09	3.08
95% CI	1.1241 to 3.0359	
t	4.309	
P	< 0.0001 (Significant)	

The analysis of onset of motor block in both the groups showed that in Group A the onset of motor block was at 10.66+/- 2.98 minutes whereas in Group B the onset of sensory block was 10.04 +/- 2.08 minutes. Statistical analysis showed that patients in Group A (Dexamethasone) and Group B (No Dexamethasone) had comparable time required

for onset of motor blockade and the difference was found to be statistically "not significant" (P= 0.188)

Table 4: Comparison of onset of motor block in both the groups.

	Onset of Motor block (Minutes)	Std Deviation
Group A	10.66	2.98
Group B	10.04	2.08
95% CI	-1.5491 to 0.3091	
t	-1.322	
P	0.188 (Not Significant)	

The analysis of duration of sensory block in both the groups showed that in Group A the duration of sensory block was 14.6+/- 1.25 minutes whereas in Group B the duration of sensory block was 11.8 ± 0.86 minutes. Statistical analysis showed that patients in Group A (Dexamethasone) had longer duration of sensory block as compared to Group B (No Dexamethasone). The difference was found to be statistically significant (P<0.0001)

Table 5: Comparison of Duration of sensory block in both the groups.

	Duration of Sensory block (Minutes)	Std Deviation
Group A	14.6	1.25
Group B	11.8	0.86
95% CI	-3.1879 to -2.4121	
t	-14.29	
P	< 0.0001 (Significant)	

The analysis of duration of motor block in both the groups showed that in Group A the duration of motor block was 11.93±1.48 minutes whereas in Group B the duration of motor block was 8.85±1.15 minutes. Statistical analysis showed that patients in Group A (Dexamethasone) had longer duration of motor block as compared to Group B (No Dexamethasone). The difference was found to be statistically significant (P<0.0001)

Table 6: Comparison of Duration of motor block in both the groups.

	Duration of Sensory block (Minutes)	Std Deviation
Group A	11.93	1.48
Group B	8.85	1.15
95% CI	-3.5592 to -2.6008	
t	-12.72	
P	< 0.0001 (Significant)	

Overall the duration of sensory as well as motor blockade was more in Group A (dexamethasone) as compared to Group B (No dexamethasone) and the difference was statistically significant.

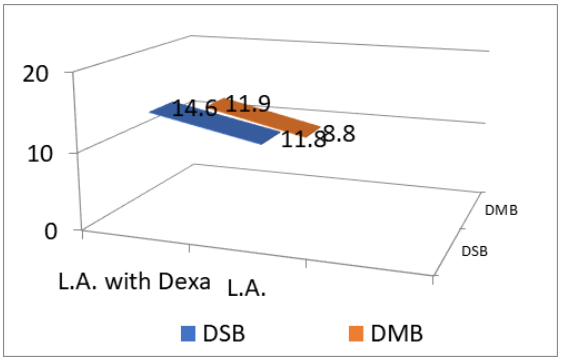

Figure 3: Duration of sensory and motor blockade in both the groups.

DISCUSSION

In this prospective comparative study of 120 patients undergoing shoulder and upper arm surgeries under interscalene block we studied onset of analgesia as well as onset and duration of sensory and motor blockade of 2 groups. Group A received local anesthetic drug with dexamethasone whereas Group B didn't receive local anesthetic without dexamethasone.

In our study that in Group A the onset of analgesia was at 7.43 +/- 1.65 minutes whereas in Group B the onset of analgesia was 6.01 +/- 1.55 minutes. Patients in Group B (No Dexamethasone) had a quicker onset of analgesic action as compared to Group A (Dexamethasone). The difference was found to be statistically significant (P<0.0001). Nanceva, J et al conducted a study to evaluate the effects of 8 mg dexamethasone administered as an adjunct to bupivacaine in interscalene brachial plexus block on the onset, duration and postoperative analgesia following upper limb surgery.[12] The study included 82 patients who were divided in two groups. The block was performed by interscalene approach and mixture of 2% lidocaine (12ml) and 0.5%bupivacaine(22ml) either alone or combined with dexamethasone (8 mg). The onset of analgesia and motor block we followed in five-time intervals (min) 10, 15, 20, 25 and 30 min. The duration of analgesia and motor block was noted every half an hour for first 10 hours and then hourly till 24 hours. The authors found that in group GD the interscalene block was completely established between 15-20 min whereas in group G in 20- 25 min. ($p \leq 0.01$). The authors concluded that duration of analgesia and motor block in GD group was significantly longer than in group G. Similar outcomes were also reported by the authors such as Chalifoux F et al and Desmet M et al.[13,14]

In our study onset of sensory blockade was found to be 7.01 +/- 2.12 minutes in Group A whereas in Group B the onset of sensory block was 9.09 +/- 3.08 minutes. The difference was found to be statistically significant. Whereas duration of sensory blockade was found to be comparable in both the groups. Jadon A et al conducted a prospective,

randomized, comparative study on patients scheduled for arthroscopic shoulder surgery under interscalene block.[15] Patients in ropivacaine group (Group R) received 30 ml of 0.5% ropivacaine plus 2 ml normal saline (n = 50) and dexamethasone-ropivacaine (Group RD) received 0.5% ropivacaine 30 ml plus 8 mg dexamethasone (4 mg/ml) (n = 50). Duration of analgesia, onset of sensory and motor block, success and failure of block, and complications were recorded and compared. The authors found that Dexamethasone significantly prolonged duration of analgesia of ropivacaine during ISB used for arthroscopic surgeries of shoulder. Similar prolonged duration of analgesia in patients who received dexamethasone for ISB has also been reported by Pehora C et al and Kawanishi R et al.[16,17]

Finally, we found in our study that addition of dexamethasone was associated with a rapid and prolonged motor block as compared to the patient in whom dexamethasone was not used as an adjuvant for ISB. Abd El-Hamid AM et al conducted a study to evaluate the effect of the addition of dexamethasone to levobupivacaine on the duration of analgesia in forearm surgeries under ultrasound-guided interscalene brachial plexus block.[18] The studied cases were divided into 2 groups. Patients in the levobupivacaine group (group L) received 25 ml of 0.5% levobupivacaine plus 2 ml of normal saline 0.9%. Patients in the levobupivacaine dexamethasone group (group LD) received 25 ml of 0.5% levobupivacaine plus 2 ml of dexamethasone (8 mg). The onset of sensory and motor block, duration of the sensory block, time to first analgesic request, the number of failed blocks, total morphine consumption, side effects, and complications were recorded and compared. The authors found that addition of dexamethasone to levobupivacaine significantly shortens the onset of sensory and motor block, prolongs the duration of analgesia, decreases the 24 h morphine consumption, and prolongs the time to first analgesic request with minimal side effects. Similar beneficial effects of addition of dexamethasone for ISB were also reported by the authors such as Stan T et al and Golwala MP et al.[19,20]

CONCLUSION

Dexamethasone added to local anesthetic drugs for Interscalene block is associated with lesser onset of time for block as well as prolongation of the duration of motor and sensory analgesia.

REFERENCES

1. Basat HÇ, Uçar DH, Armangil M, Güçlü B, Demirtaş M. Post operative pain management in shoulder surgery: Suprascapular and axillary nerve block by arthroscope assisted catheter placement. Indian J Orthop. 2016;50(6):584–589.
2. Winnie AP. Interscalene brachial plexus block. Anesth Analg. 1970 May-Jun;49(3):455-66.
3. Brattwall M, Jildenstål P, Warrén Stomberg M, Jakobsson JG. Upper extremity nerve block: how can benefit, duration, and safety be improved? An update. F1000Res. 2016;5:F1000 Faculty Rev-907. Published 2016 May 18.
4. Verma RN, Hasnain S, Sreevastava DK, Murthy TV. Anaesthetic management of forearm fractures using a combination of haematoma block and intravenous regional anesthesia. Med J Armed Forces India. 2016;72(3):247–252.
5. Shah A, Nielsen KC, Braga L, Pietrobon R, Klein SM, Steele SM. Interscalene brachial plexus block for outpatient shoulder arthroplasty: Postoperative analgesia, patient satisfaction and complications. Indian J Orthop. 2007;41(3):230–236.
6. Wahal C, Kumar A, Pyati S. Advances in regional anesthesia: A review of current practice, newer techniques and outcomes. Indian J Anaesth. 2018;62(2):94–102.
7. Brown DL. Brachial plexus anesthesia: an analysis of options. Yale J Biol Med. 1993;66(5):415–431.
8. Swain A, Nag DS, Sahu S, Samaddar DP. Adjuvants to local anesthetics: Current understanding and future trends. World J Clin Cases. 2017;5(8):307–323.
9. Chen Q, An R, Zhou J, Yang B. Clinical analgesic efficacy of dexamethasone as a local anesthetic adjuvant for transversus abdominis plane (TAP) block: A meta-analysis. PLoS One. 2018 Jun 14;13(6):e0198923.
10. Marks R, Barlow JW, Funder JW. Steroid-induced vasoconstriction: Glucocorticoid antagonist studies. J Clin Endocrinol Metab. 1982;54:1075–7.
11. Kirksey MA, Haskins SC, Cheng J, Liu SS. Local Anesthetic Peripheral Nerve Block Adjuvants for Prolongation of Analgesia: A Systematic Qualitative Review. PLoS One. 2015;10(9):e0137312. Published 2015 Sep 10.
12. Nanceva, J. Perineural Dexamethasone As Adjuvant for Interscalene Plexus Brachialis Block Anesthesia & Analgesia: September 2016 - Volume 123 - Issue 3S_Suppl - p 208.
13. Chalifoux F, Colin F, St-Pierre P, Godin N, Brulotte V. Low dose intravenous dexamethasone (4 mg and 10 mg) significantly prolongs the analgesic duration of single-shot interscalene block after arthroscopic shoulder surgery: a prospective randomized placebo-controlled study. Can J Anaesth. 2017 Mar;64(3):280-289.
14. Desmet M, Braems H, Reynvoet M, Plasschaert S, Van Cauwelaert J, Pottel H, Carlier S, Missant C, Van de Velde M. I.V. and perineural dexamethasone are equivalent in increasing the analgesic duration of a single-shot interscalene block with ropivacaine for shoulder surgery: a prospective, randomized, placebo-controlled study. Br J Anaesth. 2013 Sep;111(3):445-52.
15. Jadon A, Dixit S, Kedia SK, Chakraborty S, Agrawal A, Sinha N. Interscalene brachial plexus block for shoulder arthroscopic surgery: Prospective randomised controlled study of effects of 0.5% ropivacaine and 0.5% ropivacaine with dexamethasone. Indian J Anaesth. 2015;59(3):171–176.
16. Pehora C, Pearson AM, Kaushal A, Crawford MW, Johnston B. Dexamethasone as an adjuvant to peripheral nerve block. Cochrane Database Syst Rev. 2017;11(11):CD011770. Published 2017 Nov 9.
17. Kawanishi R, Yamamoto K, Tobetto Y, et al. Perineural but not systemic low-dose dexamethasone prolongs the duration of interscalene block with ropivacaine: a prospective randomized trial. Local Reg Anesth. 2014;7:5–9. Published 2014 Apr 5.
18. Abd El-Hamid AM, Alrabiey MA. Dexamethasone added to levobupivacaine prolongs ultrasound-guided interscalene brachial plexus blockade: a prospective, randomized, controlled study. Ain-Shams J Anaesthesiol 2016;9:422-5
19. Stan T, Goodman EJ, Bravo-Fernandez C, Holbrook CR. Adding methylprednisolone to local anesthetic increases the duration of axillary block. Reg Anesth Pain Med 2004; 29:380-381.

20. Golwala MP, Swadia VN, Dhimar AA, Sridhar NV. Pain relief by dexamethasone as an adjuvant to local anaesthetics in supraclavicular brachial plexus block. J Anaesthesiol Clin Pharmacol 2009; 25:285-288.

How to cite this article: Ingle J, Paliwal NW, Bhadage A. Interscalene Brachial Plexus Block With and Without Dexamethasone: A comparative Study. Ann. Int. Med. Den. Res. 2019; 5(2):AN22-AN27.

Source of Support: Nil, **Conflict of Interest:** None declared