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Comparison of Dexamethasone and Betamethasone in Prolonging Duration of Spinal Anesthesia in Elective Caesarean Section

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I. Introduction

Ever since the advent of anaesthesia in 1846, there have been a lot of advances in both the techniques and drugs available. The field of anaesthesia has advanced from general anaesthesia to advanced technique in regional anaesthesia. Regional anaesthesia, whether by epidural, spinal, peripheral nerve blocks or field block techniques offer a number of advantages to patients undergoing surgery as demonstrated by Beecher and Todd (1954). Regional anaesthesia can reduce or avoid the hazards and discomfort of general anaesthesia, including sore throat, airway trauma, failed intubation, post-operative pulmonary complications like aspiration pneumonitis and muscle pain. Increasing the duration of local anesthetic drugs often is a matter of concern for anesthesiologists. Epinephrine, phenylephrine, clonidine, opioids, etc. are used to increase the duration of spinal anesthesia (Murali Krishna *et al.*, 2008). Adding epinephrine to the local anesthetics may lead to tachycardia, pallor, and hypertension (Brown, 2010). Opioids control postoperative pain well; however, they are followed by nausea, vomiting, drowsiness and pruritus. At present, there is no drug able to control pain specifically without having side effects (Murali Krishna *et al.*, 2008). The use of corticosteroid compounds increases duration of anesthesia and analgesia in peripheral nerve blocks (Stan *et al.*, 2004). In addition, intravenous (IV) and oral dexamethasone considerably alleviate postoperative pain (Bisgaard*et al.*, 2003). Epidural and intrathecal steroids are used to reduce chronic pain (Price *et al.*, 2005). In some studies, intrathecal dexamethasone increased duration of sensory block and postoperative analgesia (Abdel-Aleem*et al.*, 2012). Although intrathecal dexamethasone is used to control chronic pain; few studies have been conducted on the effects of sensory block and postoperative pain in patients undergoing surgery.

Bupivacaine an amide group local anaesthetic has become a standard agent for intrathecal anaesthesia. It has a longer duration of action and also reduces the risk of transient neurological syndrome and radicular symptoms. Compared plain solution, hyperbaric solution provides a more predictable and reliable block. Hence, it has become popular for neuraxial blockade. The purpose of this investigation was to evaluate the effect of IV Dexamethasone and IV Betamethasone following spinal anesthesia with hyperbaric buopivaciane in patients undergoing lower segment caesarean section and compare the effect on sensory and motor block after spinal anesthesia.

II. Material And Methods

The present study was conducted in the postgraduate Department of Anaesthesiology and intensive Care, Govern Medical College, Jammu getting clearance from Hospital Ethical Committee. The patients enrolled were explained about the study and written information consent was taken from them. One hundred and twenty (120) female patients with ASA grade II, aged 20 to 40 years, scheduled for lower segment cesarean section under spinal anesthesia were included in this prospective, randomized study

Preparation:

Patients were kept fasting for 6 hours prior to surgery. Patients were give Pantoprazole 40 mg iv and InjMetoclopromide 10 mg iv. Patients were randomly allotted into three equal groups:

- Group B received 8 mg Betamethasone iv immediately after spinal anaesthesia with 2.5 ml of 0.5% hyperbaric bupivacaine.
- Group D received 8 mg Dexamethasone iv immediately after spinal anaesthesia with 2.5 ml of 0.5% hyperbaric bupivacaine.
- Group C- Control group received 10 ml of normal saline immediately after spinal anaesthesia with 2.5 ml of 0.5% hyperbaric bupivacaine.

Intravenous cannulation was done with 18 guage cannula and all patients were coloaded with 10 mg/kg ringer lactate solution along with the spinal anaesthesia

Heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure, were monitored and recorded every 10 minutes after the block until the end of surgery. Time calculation was started considering the time of intrathecal injection as zero. The sensory level was assessed by loss of pinprick sensation using a blunt 25G needle at mid-axillary line every 2 minutes till the fixation of the sensory level.The peak sensory level and the time to reach peak sensory level were recorded before surgery. Thereafter, the sensory level was checked after every 15 minutes till the two segment regression level and regression to segment SI were achieved. Motor level was assessed according to the modified Bromage scale:

- Bromage 0: The patient is able to move hip, knee, ankle and toes.
- Bromage 1: The patient is unable to move hip, able to move knee, ankle and toes.
- Bromage 2: The patient is unable to move hip and knee, able to move ankle and toes.

The demographic data of patients were studied foreach of the three groups. Continues covariates such asage, heart rate, SBP, DBP and MAP were compared using theanalysis of variance test. Onset time and sensory blockduration were analyzed by aT-test as appropriate. For categorical covariates (nausea, vomiting, hypotension, bradycardia) were studied using a chi-squaretest. The significance level was definedas a *p*value less than 0.05.

III. Results

The mean age of the patients in Group B was 26.5 ± 3.75, in Group D it was 25.5 ± 3.66, and in the third group, i.e., Group C(Control group)it was 25.8 ± 3.60 (Table 1). According to ANOVA test, there was no significant difference among these three groups in terms of age ($P = 0.479$). Similarly, with respect to the weight of the patients, the mean weight of Group B, D and C were 58.38 ± 7.33, 56.88 ± 7.87 and 57.63 ± 7.11, respectively. The statistical differences between these groups were non-significant ($P = 0.326$)

Perusal of the results presented in Fig. 1and 2 revealed that heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure between the study groups were comparable and statistically non-significant. At 0 minutes, the mean values of these parameters were slightly higher as compared to the baseline and thereafter it showed slight decreasing trend in all the study groups. Perusal of the Table 2 revealed that the onset of sensory block was significantly faster in Group D compared to Group B and Group C (control group) (P = 0.006). The three groups were comparable in terms of the onset of motor block (P = 0.637). The time to two-segment regression was significantly longer in Group D (148.23 ± 27.49) compared to Group B (121.22 ± 32.21) and Group C (97.40 ± 35.37)). Similarly, the time to motor block regression to Bromage 0 was significantly longer in Group D (172.23 ± 34.38) compared Group B (147.29 ± 33.34) and Group C (133.24 ± 42.51), however, there was no significant difference in motor block regression to Bromage 0 between the Group B and Group C.

The results of this study on intraoperative nausea and vomiting in three treatment groups showed non-significant difference, however, the incidence post-operative nausea and vomiting were significantly lower in Group D compared to Group B and Group C (P = 0.001 and <0.0001, respectively). Other complications such as shivering, bradycardia and hypotension were comparable in all the three study groups (Table 3).

Table 1: Age and weight distribution of patients

Groups	**Mean ± Standard deviation**	
	Age (years)	**Weight (kg's)**
Group B	26.5 ± 3.75	58.38 ± 7.33
Group D	25.5 ± 3.66	56.88 ± 7.87
Group C	25.8 ± 3.60	57.63 ± 7.11
p-value	0.479	0.326

Table 2: Comparison of onset time and duration of sensory block between the study groups

Groups	**Mean ± Standard deviation**			**p-value**
	Group B	Group D	Group C	
Onset of motor block (min.)	4.23 ± 2.13	3.84 ± 2.27	4.92 ± 2.17	0.087
Onset of sensory block (min.)	4.26 ± 3.93	3.22 ± 3.87	5.27 ± 2.93	0.043
Two-segment regression of sensory block (min)	121.22 ± 32.21	148.23 ± 27.49	97.40 ± 35.37	<0.0001
Motor block regression to Bromage 0 (min)	147.29 ± 33.34	172.23 ± 34.38	133.24 ± 42.51	<0.0001

Table 3: Comparison of complications with spinal anesthesia in three groups

Groups	**Number of patients (%)**			**p-value**
	Group B	Group D	Group C	
Intraoperative vomiting	3 (7.50)	2 (5.00)	5 (12.50)	0.148
Intraoperative nausea	4 (10.00)	3 (7.50)	6 (15.00)	0.221
Post-operative vomiting	5 (12.50)	2 (5.00)	9 (22.50)	0.001

Post-operative nausea	6 (15.00)	1 (2.50)	9 (22.50)	<0.0001
Shivering	5 (12.50)	4 (10.00)	7 (17.50)	0.283
Bradycardia	3 (7.50)	1 (2.50)	4 (10.00)	0.095

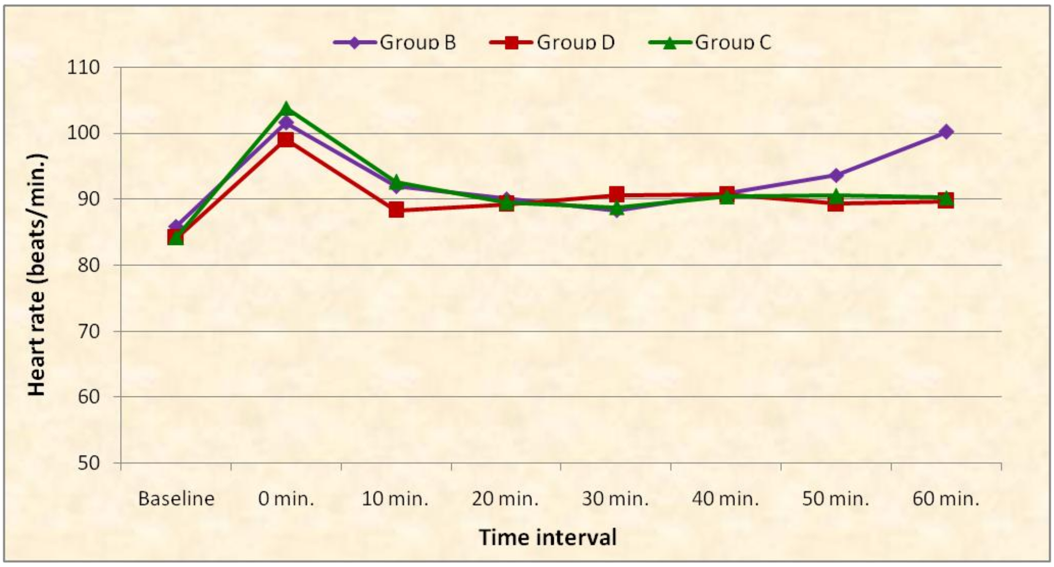

Fig. 1: Group comparison for heart rate (beats/min.)

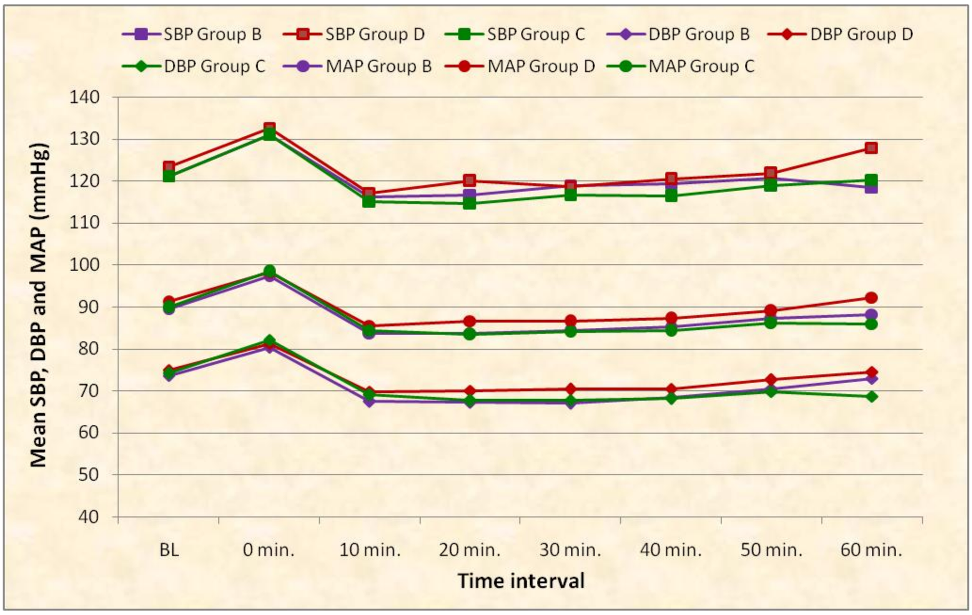

Fig. 2: Group comparison for SBP, DBP and MAP (mmHg)

IV. Discussion

Spinal anesthesia is the most commonly used technique for cesarean section as it is very economical and easy to administer. It reduces mortality rate associated with cesarean section by sixteen times when compared with general anesthesia. Spinal anesthesia avoids the risks of general anesthesia such as aspiration of gastric contents, difficulty with airway management, infant respiratory distress, and mothers' awareness during operation (Brown, 2010). This technique has an added advantage of retaining consciousness, excellent surgical field, extended pain relief, low incidence thromboembolism and earlier return of GI function. It also has an important role in facilitating ambulatory anesthesia and reducing immediate post-operative pain. Inadequate post-operative pain results in delayed recovery, prolonging the hospital stay, ultimately increasing health care cost and delays mother child bonding.

The aim of the present work is to evaluate the effect of IV Dexamethasone and IV Betamethasone following spinal anesthesia with hyperbaric buopivaciane in patients undergoing lower segment caesarean section and compare the effect on sensory and motor block after spinal anesthesia. The demographic data (age and weight) were matched between the study groups and were found comparable. In the present study there was no significant change in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressureduring intraoperative and postoperative in each of the studied groups. Comparison of vital signs (HR, SBP, DAP and MAP) at different intervals showed no statistical difference between the study groups.

The results of the current study indicate that administration of dexamethasone (8 mg) intravenously in patients undergoing lower segment cesarean section under spinal anesthesia results in prolonging the duration of sensory block. Further, the present study found that dexmedetomidine added to intrathecal bupivacaine was associated with a faster onset and longer duration of the sensory blockade compared to the control group inlower segment caesarean section under spinal anesthesia. In addition, it causes longer duration of motor block and more sedation. Meanwhile, addition of dexamethasone prolonged duration of sensory block. Dexmedetomidine's ability to prolong sensory and motor blockade could be explained by being a highly selective α^2-adrenergic receptor agonist. In addition, it has sedative, analgesic, perioperative sympatholytic, anesthetic-sparing and hemodynamic-stabilizing properties (Khan *et al.*, 1999). Moreover, it has the advantage of no respiratory depression (Carollo*et al.*, 2010). In the spinal cord, it activates α2-adrenergic receptors in the neurons of the superficial dorsal horn (Ishii *et al.*, 2008). It directly reduces pain transmission by reducing the release of pronociceptive transmitter, substance P, and glutamate from primary afferent terminals, and by hyperpolarizing spinal interneurons by G-protein-mediated activation of potassium channels (Stone *et al.*, 1998). The possible explanation of the effect of adding dexmedetomidine to intrathecal bupivacaine lies in its synergistic effect being selective α^2-adrenergic receptor agonist, which binds to the presynaptic C-fibers and postsynaptic dorsal horn neurons. Thus, it produces analgesia by depressing the release of C-fiber transmitters, hyperpolarization of postsynaptic dorsal horn neurons, whereas bupivacaine as a local anesthetic acts by blocking sodium channels (Kanazi*et al.*, 2006). Results of the present study are in close agreement with the study conducted by Shukla *et al.* (2011) who compared dexmedetomidine versus magnesium sulfate added to intrathecal bupivacaine and found that dexmedetomidine shortened the onset and prolonged the duration of spinal anesthesia. Another recent study proved superiority of intrathecal dexmedetomidinein comparison with clonidine and fentanyl. It provided prolonged motor and sensory block and reduced demand of additional analgesics (Solanki *et al.*, 2013).

Steroids have a powerful anti-inflammatory as well as analgesic property but the mechanism of the analgesia induced by corticosteroid is not fully understood (Ahlgren*et al.*, 1997). Epidural steroids were used for back pain treatment. Intrathecal dexamethasone may influence intraspinal prostaglandin production. Acute noxious stimulation of peripheral tissues leads to sensitization of dorsal horn neurons of the spinal cord by the release of substances such as glutamate and aspartate. These amino acids activate N-methyl-D-Aspartate receptors resulting in calcium ion influx which leads to activation of phospholipase A2, which converts membrane phospholipase to arachidonic acid. Corticosteroids are capable of reducing prostaglandin synthesis by inhibition of phospholipase A2 through the production of calcium-dependent phospholipid binding proteins called annexins and by the inhibition of cyclooxygenases during inflammation (Yao *et al.*, 1999).

According to our results, nausea and vomiting after cesarean section occur in almost 10–20% of patients, which are the second common complaint made by them (Dolin *et al* ., 2002). Different studies in this field showed that personal particulars of the patient and the way of anesthetizing are two important factors for this (Eberhart*et al.*, 2000). In patients, this complication makes perilous problems, by preventing nausea and vomiting, they feel consent and comfort (Darkow*et al.*, 2001). Although in most cases nausea and vomiting are controlled spontaneously, sometimes it can result in complications such as aspiration, suture dehiscence, esophageal rupture, subcutaneous emphysema and pneumothorax in preventing this complication and recognizing effective factors.

Dexamethasone has an antiemetic effect by inhibition of releasing prostaglandins and serotonin in the gastrointestinal tract and endorphin in the nervous system (Hong *et al.*, 2010). The effect of different dosages of glucocorticoids on reduction of post-operative nausea and vomiting has been documented in numerous studies (Cardoso *et al.*, 2013) though the minimum dose of Dexamethasone has been reported from 2.5 mg for gynecologic surgeries to 5 mg for thyroidectomy (Wang *et al* ., 2000). However, we didn't find any significant differences with this regard between the study groups in our study. Multiple doses of corticosteroid therapy (more than 1 week) may cause side-effects such as increase risk of infection, glucose intolerance, delayed wound healing, superficial ulceration of gastric mucosa, avascular necrosis of the femoral head and adrenal suppression (Cook *et al.*, 1999); however, these side-effects were not found after a single dose of Dexamethasone therapy (Wang *et al.*, 2000).

Demirhan *et al.* (2013) during a research on the effect of ondansetron + dexamethasone and each of them alone on nausea and vomiting in women who experienced cesarean intraoperative nausea and vomiting with spinal anesthesia, found out that there was not any significant difference among three groups which was contrary to our results. Nausea in dexamethasone group was more than the other groups, and then it was ondansetron group, and finally the group of ondansetron + dexamethasone. Considering intraoperative vomiting, dexamethasone group gained top place, but in the recovery room, there was not any significant difference among the groups. They did not analyze these two factors in the recovery room.Other complications viz., shivering, bradycardia and hypotension were comparable in the present study. Nortcliffe *et al.* (2003) also observed similar outcome in cesarean section patients.

V. Conclusion

The present study concludes that for lower segment caesarean section, dexamethasone IV should be used for spinal anaesthesia with 2.5 ml of 0.5% hyperbaric bupivacaine, however, more studies needs to be conducted to arrive at final conclusions.

References

[1]. Abdel-Aleem M, Osman A, Morsy K. Effect of coadministration of dexamethasone with intrathecal morphine on postoperative outcomes after cesarean delivery. Int J GynaecolObstet 2012; 116(2): 158-61.

[2]. Ahlgren SC, Wang JF, Levine JD. C-fiber mechanical stimulusresponse functions are different in inflammatory versus neuropathic hyperalgesia in the rat. Neuroscience. 1997; 76: 285–90.

[3]. Beecher HK, Todd DP. A study of the deaths associated with anesthesia and surgery: based on a study of 599, 548 anesthesias in ten institutions 1948-1952, inclusive. Ann Surg 1954; 140: 2–35.

[4]. Bisgaard T, Klarskov B, Kehlet H, Rosenberg J. Preoperative dexamethasone improves surgical outcome after laparoscopic cholecystectomy: A randomized double-blind placebo-controlled trial. Ann Surg 2003; 238: 651-60.

[5]. Brown DL. Spinal, epidural and caudal anesthesia. In: Miller RD. Anesthesia. 7th ed. Philadelphia: Churchill Livingstone; 2010: 1611-1638.

[6]. Cardoso MM, Leite AO, Santos EA, Gozzani JL, Mathias LA. Effect of dexamethasone on prevention of postoperative nausea, vomiting and pain after caesarean section: A randomised, placebo-controlled, double-blind trial. Eur J Anaesthesiol. 2013; 30: 102–5.

[7]. Carollo DS, Nossaman BD, Ramadhyani U. Dexmedetomidine: a review of clinical applications. CurrOpinAnaesthesiol 2008; 21: 457– 461.

[8]. Cook AM, Patterson H, Nicholls J, Huddart RA. Avascular necrosis in patients treated with BEP chemotherapy for testicular tumours. ClinOncol (R CollRadiol) 1999; 11: 126–7.

[9]. Darkow T, Gora-Harper ML, Goulson DT, Record KE. Impact of antiemetic selection on postoperative nausea and vomiting and patient satisfaction. Pharmacotherapy. 2001; 21: 540-48.

[10]. Demirhan A, Tekelioglu YU, Akkaya A, Ozlu T, Yildiz I, Bayir H, *et al* . Antiemetic effects of dexamethasone and ondansetron combination during cesarean sections under spinal anaesthesia. Afr Health Sci. 2013; 13: 475–82.

[11]. Dolin SJ, Cashman JN, Bland JM. Effectiveness of acute postoperative pain management: I. Evidence from published data. Br J Anaesth. 2002; 89: 409–23.

[12]. Eberhart LH, Högel J, Seeling W, Staack AM, Geldner G, Georgieff M. Evaluation of three risk scores to predict postoperative nausea and vomiting. ActaAnaesthesiol Scand. 2000; 44: 480–8.

[13]. Hong JY, Han SW, Kim WO, Kim EJ, Kil HK. Effect of dexamethasone in combination with caudal analgesia on postoperative pain control in day-case paediatricorchiopexy. Br J Anaesth. 2010; 105: 506–10.

[14]. Ishii H, Kohno T, Yamakura T, Ikoma M, Baba H. Action of dexmedetomidine on the substantia gelatinosa neurons of the rat spinal cord. Eur J Neurosci 2008; 27: 3182–31 90.

[15]. Kanazi GE, Aouad MT, Jabbour-Khoury SI, Al Jazzar MD, Alameddine MM, Al-Yaman R, *et al* . Effect of low-dose dexmedetomidine or clonidine on the characteristics of bupivacaine spinal block. ActaAnaesthesiolScand 2006; 50: 222–2 27.

[16]. Khan ZP, Ferguson CN, Jones RM. Alpha-2 and imidazoline receptor agonists. Their pharmacology and therapeutic role. Anaesthesia 1999; 54: 146– 165.

[17]. Murali Krishna T, Panda NB, Batra YK and Rajeev S. Combination of low doses of intrathecal ketamine and midazolam with bupivacaine improves postoperative analgesia in orthopaedic surgery. Eur J Anaesthesiol 2008; 25(4): 299-306.

[18]. Nortcliffe SA, Shah J, Buggy DJ. Prevention of postoperative nausea and vomiting after spinal morphine for caesarean section: Comparison of cyclizine, dexamethasone and placebo. Br J Anaesth. 2003; 90: 665–70.

[19]. Price C, Arden N, Coglan L and Rogers P. Cost-effectiveness and safety of epidural steroids in the management of sciatica. Health Technol Assess 2005; 9(33): 1-58.

[20]. Shukla D, Verma A, Agarwal A, Pandey HD, Tyagi C. Comparative study of intrathecal dexmedetomidine with intrathecal magnesium sulfate used as adjuvants to bupivacaine. J AnaesthesiolClinPharmacol 2011; 27: 495–4 99.

[21]. Solanki SL, Bharti N, Batra YK, Jain A, Kumar P, Nikhar SA. The analgesic effect of intrathecal dexmedetomidine or clonidine, with bupivacaine, in trauma patients undergoing lower limb surgery: a randomised, double-blind study. Anaes. Intensive Care 2013; 41: 51– 56.

[22]. Stan T, Goodman EJ, Bravo-Fernandez C and Holbrook CR. Adding methylprednisolone to local anesthetic increases the duration of axillary block. RegAnesth Pain Med 2004; 29(4): 380-1.

[23]. Stone LS, Broberger C, Vulchanova L, Wilcox GL, Hokfelt T, Riedl MS, *et al* . Differential distribution of alpha2A and alpha2C adrenergic receptor immunoreactivity in the rat spinal cord. J Neurosci 1998; 8: 5928–59 37.

[24]. Wang JJ, Ho ST, Lee SC, Liu YC, Ho CM. The use of dexamethasone for preventing postoperative nausea and vomiting in females undergoing thyroidectomy: A dose-ranging study. AnesthAnalg. 2000; 91: 1404–7.

[25]. Yao XL, Cowan MJ, Glawin MT, Lawrence MM, Angus CW, Shelhamer JH. Dexamethasone alters arachidonate release from human epithelial cells by induction of P11 protein synthesis and inhibition of phospholipas A_2 activity. J Biol Chem. 1999; 274: 17202–8.

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