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# EPIDURAL VERSUS SYSTEMIC ADMINISTRATION OF ALPHA 2 AGONISTS IN SHEEP

(With 3 Tables)

By

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(Received at 19/6/2004)

## الحقن فوق الأم الجافية مقارنة بالحقن العضلى لعقارات مؤثرة على مستقبلات ألفا ٢ فى الأغنام

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يعتبر عقارى الزيلازين والديتوميدين هما أكثر العقارات المؤثرة على مستقبلات ألفا ٢ الأدرينالية فى المجترات. استهدفت هذه الدراسة المقارنة بين التأثير المهدئ والمسكن لكلا العقارين عند استخدامهما بالحقن فوق الأم الجافية وبالحقن العضلى. استخدمت ستة أغنام سليمة إكلينيكياً (١-٣ سنوات من العمر وتزن ٢٠- ٤٥ كجم). استخدمت كل منهم فى أربعة تجارب بينهما أسبوع على الأقل. التجربة الأولى: تم فيها حقن الزيلازين بجرعة ٠,٣ مجم/كجم فى العضل. التجربة الثانية: تم فيها حقن الزيلازين بجرعة ٠,٣ مجم/كجم فوق الأم الجافية. التجربة الثالثة: تم فيها حقن الديتوميدين بجرعة ٢٠ ميكروجم/ كجم فى العضل. أما التجربة الرابعة فقد تم فيها حقن اديتوميدين بجرعة ٢٠ ميكروجم/ كجم فوق الأم الجافية. تم حساب التأثير المهدئ والمسكن للأدوية بعد الحقن فى كل مرة. تم قياس معدل النبض والنفس ودرجة الحرارة وحركة الكرش كل ١٥ دقيقة من بدء التجربة وحتى نهايتها. كما تم تجميع عينات من الدم لعمل بعض القياسات الدموية والبيوكيميائية فى نفس الوقت. باجراء التحليل الإحصائى للنتائج وجد أن. تم الوصول إلى التأثير المهدئ فى كل الحيوانات المعالجة كما ظهر التأثير المسكن خلال دقيقتين فى كل المجموعات أما بالنسبة لمدة التأثير المسكن فقد كانت أطول بعد حقن الزيلازين فوق الأم الجافية (١٠٨ ± ١٧ دقيقة) بالمقارنة بكل من حقن الزيلازين فى العضل أو حقن الديتوميدين فى العضل أو فوق الأم الجافية (٣٧ ± ٣٦,٧ و ٥,٧ ± ٣٣ و ٨,٣ ± دقيقة على الترتيب). كان التأثير المسكن فى الذيل ومنطقة العجان والأرجل الخلفية والخاصرة وجدار الصدر والأرجل الأمامية متوسطاً بعد حقن الزيلازين فى العضل. أما بعد حقنه فوق الأم الجافية فقد كان التأثير المسكن للذيل والعجان والأرجل الخلفية والخاصرة كاملاً وفعالاً. أما بعد حقن الديتوميدين فقد كان التأثير ضعيف إلى متوسط. لوحظ عدم قدرة الحيوان على الوقوف والترنح بعد حقن كلا العقارين وخاصة بعد حقن الزيلازين فوق الأم الجافية الذى أدى إلى رقود الحيوان أرضاً. كانت التغيرات فى

الأعـــراض الاكلينيكـــية وصورة الدم مؤقتة وعادت كما كانت قبل التجربة. استنادا إلى هذه النـــتائج فقد تبين أن حقن الزيلازين فوق الأم الجافية فى الأغنام يضمن درجة أفضل للتأثير المســـكن للذيـــل والعجان والأرجل الخلفية والخاصرة بالمقارنة بما تحققه نفس الجرعة من الحقن العضلى.

## SUMMARY

Xylazine and detomidine are commonly used alpha 2 adrenoceptor agonists in ruminants. The aim of the study was to compare the sedative and analgesic properties of xylazine and detomidine when administered IM and epidurally (EPI). Six, healthy sheep (1-3 years) and weighing 20 - 45 kg were used in the study. Each sheep was studied on 4 occasions, at weekly intervals, and each received all of the treatments. The following treatments were administered: Group 1 (xylazine, 0.3 mg/kg, IM), Group 2 (xylazine, 0.3 mg/kg, EPI), Group 3 (detomidine, 20 μg/kg, IM) and Group 4 (detomidine, 20 μg/kg, EPI). Sedative and analgesic effects of both drugs were recorded. Analgesia was determined by the response to a needle prick. Pulse rate, respiratory rate, rectal temperature and ruminanl motility were recorded at 15 minutes intervals following drug administration and continued until recovery. Blood was collected for hematological and biochemical analysis at the same time intervals. Descriptive statistical analysis was performed. Sedation was evident in all treated sheep. Analgesia occurred within two minutes with no significant difference in its time of onset among the four groups. Duration of analgesia was longer following EPI xylazine (108 ± 17 minutes) than that following IM xylazine, IM detomidine, and EPI detomidine (37 ± 7, 36 ± 5.7 and 33 ± 8.3, respectively). Analgesia of the tail, perineum, hind limbs, flank, thoracic wall and fore limbs was moderate following IM xylazine, but mild after IM detomidine. Following EPI xylazine, analgesia of the tail, perineum, hind limbs and flank was complete, but after EPI detomidine, it was mild to moderate. Ataxia was evident following IM administration of either drugs, but was marked following their EPI administration, especially in the case of xylazine, which produced recumbency on all occasions. Changes in the clinical, hematological, and biochemical parameters were transient and returned to the pre-injection values at the end of the experiment. Based on these findings, epidural administration of xylazine to sheep produces a greater degree of analgesia for the tail, perineum, hind limbs and flank region than similar doses administered IM.

***Key words:*** *Epidural, alpha 2 agonists, xylazine, detomidine, sheep*

## INTRODUCTION

Surgical interference posterior to the diaphragm and operations in the hindquarters are important general indications for spinal analgesia, where general anesthesia is contraindicated (Nelson *et al.*, 1979). Epidural administration of drugs is carried out in the expectation that the effects of the drug will be localized and more intense in a certain area of the body than when the drug is administered systemically (Pascoe, 1997).

Xylazine is used in veterinary practice as a sedative with analgesic and muscle relaxant properties (Aziz and Carlyle, 1978 and Aziz and Martin, 1978). Systemic xylazine is used for sheep (Mohamed *et al.*, 1976; Shokry *et al.*, 1976; and Tantawy, 1978); for buffaloes (Khamis and Saleh, 1970 and Fouad and Shokry, 1973); for cattle (Stewart, 1972 and Mbiuki, 1981); for camel (Khamis *et al.*, 1973); and is used routinely in dogs, cats and horses (Adams, 1988).

Caudal epidural analgesia using xylazine was successfully conducted in donkeys (Makady *et al.*, 1991 and Saleh and Ali, 1993), and in cattle (Skarda, 1990; Skarda *et al.*, 1990; Seleim *et al.*, 1991; and Abdel-Maboud and Shabaan, 1995).

Detomidine was developed for use as a sedative analgesic in horses and cattle (Thurmon *et al.*, 1996). Compared to xylazine, detomidine has higher potency and greater specificity at central α 2 – adrenoceptor sites (Virtanen and MacDonald, 1985). The aim of the study was to compare the sedative and analgesic properties of xylazine and detomidine when administered intramuscularly (IM) and epidurally (EPI) in sheep.

## MATERIALS and METHODS

Six, healthy sheep (1-3 years) weighing 20 - 45 kg were used in the study. Each sheep was studied on 4 occasions, at weekly intervals, and each received all of the treatments. The following treatments were administered: Group 1 (xylazine, 0.3 mg/kg, IM, *Rompun*, Bayer, Leverkusen, Germany), Group 2 (xylazine, 0.3 mg/kg, EPI), Group 3 (detomidine, 20 μg/kg, IM, *Domosedan*, Bohringer Ingelheim Vetmedica GmbH, Ingelheim, Germany) and Group 4 (detomidine, 20 μg/kg, EPI).

Epidural injection was carried out in the lumbosacral space after its routine preparation for aseptic injection using a 20 – gauge, 4-cm needle after dilution of the drug in 2 ml saline solution.- Sedative and analgesic effects of both drugs were recorded.

Analgesia was determined by the response to a needle prick. Pulse rate, respiratory rate, rectal temperature and ruminal motility were recorded at 15 minute intervals following drugs administration and continued until recovery.

Blood was collected at the same time intervals for determination of hemoglobin (Hb%), packed cell volume (PCV), total leucocytic count (TLC), and biochemical analysis (ALT = alanin transaminase, ASR = aspartat transaminase, BU = blood urea, and GLU = glucose).

Descriptive statistical analysis by t-test and one-way ANOVA using Statistical Product & Service Solutions (SPSS) was performed after Kuehl (1994).

## RESULTS

Sedation was evident in all treated sheep with no significant difference in onset and duration among four groups (Table, 1).

Degree of sedation was determined according to its signs. It varied between slight to heavy sedation after epidural detomidine and epidural xylazine, respectively (Table, 1). Signs of sedation were recorded as sleep-like state following epidural detomidine. Following epidural xylazine, it was the same associated with recumbency. Slight tremor of the face and lips, and a tendency to head press and lean forward were noticed following systemic xylazine detomidine.

Analgesia occurred within two minutes with no significant difference in its time of onset amoung the four groups. Duration of analgesia was longer following EPI xylazine (108 ± 17 minutes) than that following IM xylazine, IM detomidine, and EPI detomidine (37 ± 7, 36 ± 5.7, and 33 ± 8.3 minutes, respectively) (Table, 1).

Analgesia of the tail, perineum, hind limbs, flank, thoracic wall, and fore limbs was moderate following IM xylazine, but mild after IM detomidine. Following EPI xylazine, analgesia of the tail, perineum, hind limbs, and flank was complete, but after EPI detomidine, it was mild to moderate (Table, 1).

Ataxia was evident following IM administration of either drugs, but marked following their EPI administration, especially in the case of xylazine, which produced recumbency.

A significant difference was found in the onset, duration and degree of ataxia among the four groups (Table, 1). Marked ataxia was evident following IM xylazine after 4 ± 1.25 minutes and extended for 88 ± 12 minutes. Following EPI xylazine, recumbency occurred after 3 ± 0.1 minutes and animals were unable to stand for 100 ± 18 minutes.

Following IM and EPI detomidine, moderate to marked ataxia was evident, 7 ± 2.1 and 5.5 ± 2.1 minutes, respectively, and lasted for 60 ± 11.3 and 33 ± 9.7 minutes, respectively (Table, 1).

Pulse rate was significantly decreased, but no significant changes were found in respiratory rate and body temperature after injections of either drugs in both routes (Table, 2).

Salivation was noticed in all sheep after IM or EPI detomidine. It was massive after IM or EPI xylazine.

Urination was also detectable in sheep treated with IM and EPI xylazine or detomidine.

Ruminal hypomotility was observed following IM administration of either drug. No ruminal movement with clear bloat was observed during the observation period after EPI xylazine or detomidine.

Changes in the hematological biochemical parameters were transient and returned to the pre-injection values at the end of the experiment (Table, 3).

## DISCUSSION

Epidural analgesia is a common practice in veterinary medicine. Local anesthetics are usually administered. Other drugs like α 2 – adrenoceptor agonists may produce analgesia in the perineal region (Gomez de Segura *et al.* (1997).

The sedative effect provided following epidural administration of xylazine or detomidine could be attributed to systemic uptake of the drugs when epidural doses are given as well as their interacting with the adrenergic system in the spinal cord (Pascoe, 1997). Signs of sedation in sheep in the present study resembled those described by Thurmon et al. (1996) in general. Hall and Clarke (1991) noticed that sedation in ruminants and small animals is dose-dependant, and higher doses may cause recumbency, unconsciousness, and a state close to general anesthesia.

Detomidine appeared to induce sedation, however, of longer duration than that provided by equivalent doses of xylazine. These results coincided with those described by Virtanen & Nyman (1985); Clarke and Taylor (1986); Clarke *et al.* (1986) and Jochle & Hamm (1986). The findings of Virtanen and MacDonald (1985) could explain such results, as they found that detomidine has higher potency and greater specificity at the central α 2-adrenoceptors, as compared with xylazine.

Analgesia in this experiment was measured depending on absence of response to a standard painful stimulus consisting of needle skin and deep muscle pin pricking. Incidence of analgesia in sheep following either systemic or epidural xylazine or detomidine was rapid (1.35 ± 0.011 to 1.96 ± 0.025 minutes) as compared with its incidence in cattle and llamas (10 to 20 minutes) and in horses (32 minutes) following systemic xylazine, as described by Pascoe (1997). Such variations could be attributed to species variations. Shokry *et al* (1976) considered systemic xylazine is a suitable technique for inducing required satisfactory state of analgesia in sheep without side effects. In the present study, it was noticed that analgesia obtained in sheep following epidural xylazine was potent and of longer duration as compared to that obtained after other drug groups. These findings coincided with those described by Leblanc *et al.* (1988) and Caron and LeBlanc (1989) who found that epidurally administered xylazine produces a longer duration of increased avoidance threshold than does intramuscularly administered xylazine. Kariman (1997) found that epidural injection of detomidine alone could not provide sufficient surgical analgesia in cow. On the same time, Ko *et al.* (1992) found that epidural xylazine induced surgical analgesia caudal to umbilicus for 120 minutes where detomidine induced minimal analgesia in the same region. Regarding the analgesic area, the results of the present experiment coincided with those obtained by Aminkov and Habenov (1995) and Mpanduji *et al.* (1999). Analgesia in their experiment included hind limbs, abdominal wall and extended up to the thoracic vertebrae (T5 and T6). Profound analgesia provided by epidural xylazine could be attributed to three factors: Firstly, its local anesthetic effect, characterized by blockade of action potential and conducting velocity (Aziz and Martin, 1978). Secondly, it produces a portion of its analgesic action through activation of spinal cord alpha 2- adrenoceptors (Waterman *et al.*, 1988 and Thurmon *et al.*, 1996); finally, to its similar chemical structure to lidocaine (Thurmon *et al.*, 1996 and Pascoe, 1997).

Regarding the standing capacity of the treated sheep, the results of this experiment showed that marked ataxia and recumbency were associated with xylazine, especially when administered epidurally. These findings come in agreement with that observed by Kenawy (1998), who found that 0.3 – 0.5 mg/kg epidural xylazine led to ataxia and recumbency in goat. The same author added that 15 µg/kg epidural detomidine did not cause ataxia. This may be due to drug, dose, and species variations. Persistence of sheep that received epidural xylazine in

recumbent position for 100 ± 18 minutes, confirm that xylazine produces its action by two ways; membrane stabilizing effects, and activation of the spinal cord alpha 2-adrenoceptors (Waterman *et al.*, 1988).

Significant decrease in pulse rate was similar to the findings described by Thurmon *et al.* (1996), after alpha –2 adrenergic agonists in general, and to the findings of Kinjavdekar *et al.* (1999) in goats. Findings of this study come in agreement with Seifelnasr *et al.* (1974) who recorded that xylazine led to prolonging the gastro-intestinal transit time. Rectal temperature, respiratory rate, and hemato-biochemical parameters did not significantly differ among the four groups and returned to the pre-injection values rapidly. A similar findings were reported in donkeys following systemic detomidine (Nouh and El-Ashmawy, 1997) and systemic romifidine (Nouh and Abdel-Wahed, 2000). Tranqulli *et al.* (1989) considered the dose-dependent cardio-pulmonary depression is the only disadvantages of using xylazine as analgesic. They considered 0.1- 0.3 mg/kg xylazine 15 a non depressant dose. Occurrence of salivation following drug administration was explained by the findings of Green and Thurmon (1988), as a drooling, likely due to decreased swallowing.

Incidence of urination was also reported in cattle (Thurmon *et al.*, 1978), horses (Thurmon *et al.*, 1984), ponies (Trim and Henson, 1986), and in cats (Hartsfield, 1980) following systemic xylazine. Aminkov and Habenov (1995) noticed that the eye remained closed for 30 minutes with excessive salivation and frequent urination following epidural administration of 0.4 mg/kg xylazine in rams. Hall and Clarke (1991) attributed the increased urine production to inhibition of ADH release. High significant increase of the serum glucose following all drugs administrations may be attributed to increase hepatic glucose production, transient hypoinsulinemia and hyperglycemia due to inhibition of insulin secretion (Symonds, 1976 and Symonds & Mallinson, 1978). Shokry *et al* (1976) found that serum glucose and GOT levels were slightly increased after systemic xylazine injection and returned to normal level after two hours Hsu and Hummel (1981) also found that inhibition of insulin release is mediated by alpha 2-adrenoceptors in pancreatic beta cells.

Based on these findings, epidural administration of xylazine and detomidine to sheep produces a greater degree of analgesia for the tail, perineum, hind limbs and flank region than similar doses administered IM.

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Table 1 : Showing M ± SD values of sedation, analgesia and ataxia following systemic and epidural administration of xylazine or detomidine in sheep.

| Drug Group | Sedation | | | Analgesia | | | Ataxia | | |
|---|---|---|---|---|---|---|---|---|---|
| | Onset Min. | Duration Min. | Degree | Onset Min. | Duration Min. | Area of Analgesia | Onset Min. | Duration Min. | Degree |
| Systemic XYL | 2.60 ± 0.19 | 105 ± 34 | Moderate | 1.96 ± 0.025 | 37 ± 7 | Tail, perineum, limbs, flank, and thoracic wall. | 4.00 ± 1.25 | 88* ± 12 | Marked |
| Epidural XYL | 2.25 ± 0.13 | 102 ± 28 | Heavy | 1.69 ± 0.019 | 108** ± 17 | Tail, perineum, hind limbs, and flank. | 3.00 ± 0.10 | 100* ± 18 | Recumbent |
| Systemic DETO | 2.44 ± 0.23 | 114 ± 41 | Moderate | 1.35 ± 0.011 | 36 ± 5.66 | Tail, perineum, limbs, flank, and thoracic wall. | 7.00* ± 2.11 | 60 ± 11.25 | Moderate |
| Epidural DETO | 2.11 ± 0.011 | 104 ± 31 | Slight | 1.40 ± 0.021 | 33 ± 8.25 | Tail, perineum, hind limbs, and flank. | 5.50 ± 2.07 | 33 ± 9.66 | Marked |

XYL, means Xylazine.
DETO, means Detomidine

* Significance difference (at $P < 0.05$).
** High significance difference (at $P < 0.01$).

Table 2 : Showing M ± SD Values of Pulse rate, Respiratory rate, and Rectal temperature following systemic and epidural administration of xylazine or detomidine in sheep.

| Drug Group | Observation time (Minutes) | Pulse rate (rate / min.) | Respiratory rate (rate / min.) | Rectal temperature ( C) |
|---|---|---|---|---|
| Control Values | 5 min. before injection | 82.0 ± 7.0 | 25.0 ± 13.0 | 40.9 ± 0.031 |
| Systemic XYL | 15 min. after injection | 65.3 ± 0.4 * | 29.0 ± 8.75 | 40.1 ± 0.04 |
| | 30 min. after injection | 52.3 ± 0.34 * | 27.33 ± 7.6 | 39.7 ± 0.013 |
| | 60 min. after injection | 60.0 ± 1.0 * | 24.6 ± 11.25 | 39.8 ± 0.03 |
| | 90 min. after injection | 71.0 ± 1.0 | 27.66 ± 8.12 | 40.4 ± 0.1 |
| Epidural XYL | 15 min. after injection | 60.0 ± 0.8 * | 31.6 ± 8.66 | 40.33 ± 0.03 |
| | 30 min. after injection | 54.0 ± 0.44 * | 28.6 ± 7.33 | 39.8 ± 0.02 |
| | 60 min. after injection | 64.3 ± 1.25 * | 25.6 ± 13.34 | 39.13 ± 0.03 |
| | 90min. after injection | 76.6 ± 2.22 | 25.0 ± 14.0 | 39.43 ± 0.02 |
| Systemic DETO | 15 min. after injection | 48.0 ± 4.66 * | 29.3 ± 7.6 | 40.6 ± 0.024 |
| | 30 min. after injection | 50.5 ± 1.33 * | 24.66 ± 6.0 | 39.8 ± 0.02 |
| | 60 min. after injection | 64.66 ± 0.68 * | 25.33 ± 11.33 | 39.13 ± 0.03 |
| | 90 min. after injection | 74.3 ± 7.13 | 26.0 ± 8.66 | 39.6 ± 0.024 |
| Epidural DETO | 15 min. after injection | 42.0 ± 4.0 * | 30.0 ± 9.0 | 40.53 ± 0.07 |
| | 30 min. after injection | 40.33 ± 1.34 * | 27.33 ± 1.33 | 40.1 ± 0.06 |
| | 60 min. after injection | 64.33 ± 1.34 * | 23.0 ± 7.0 | 39.9 ± 0.1 |
| | 90 min. after injection | 72.66 ± 6.34 | 25.33 ± 12.33 | 40.36 ± 0.1 |

XYL, means Xylazine - DETO, means Detomidine.

* Significant difference at ($P < 0.05$).

Table 3 : Showing M ± SD values of Packed Cell Volume (PCV), Hemoglobin (Hb), Total leucocytic count (TLC), Alanin transaminase (ALT), Aspartate transaminase (AST), Blood Urea (BU), and Glucose (Glu) following systemic and epidural administration of xylazine or detomidine in sheep.

| Drug Group | Observation Time (Minutes) | PCV (%) | Hb (g/dl) | TLC (x1000/mm3) | ALT (U/L) | AST (U/L) | BU (mg/dl) | Glu (mg/dl) |
|---|---|---|---|---|---|---|---|---|
| Control | 5 min. before | 35.5 ± 1.6 | 12.0 ± 0.66 | 15.13 ± 0.35 | 32.4 ± 2.12 | 29.5 ± 1.7 | 64.6 ±3.11 | 114 ± 10 |
| Systemic XYL | 15 min. after | 35.9 ± 1.91 | 11.8 ± 0.5 | 15.5 ± 0.55 | 31.6 ± 1.9 | 32.25 ± 1.3 | 60.22 ± 4.1 | 203 ± 16 ** |
| | 30 min. after | 35.8 ± 2.0 | 11.4 ± 0.9 | 16.6 ± 1.25 | 33.6 ± 3.0 | 30.5 ± 1.6 | 58.6 ± 3.7 | 297 ± 29 ** |
| | 60 min. after | 36.0 ± 1.7 | 10.9 ± 1.25 | 15.4 ± 0.88 | 33.5 ± 2.6 | 27.0 ± 0.88 | 54.7 ± 2.8 | 280 ± 31 ** |
| | 90 min. after | 35.4 ± 2.0 | 11.2 ± 0.8 | 16.3 ± 1.33 | 31.3 ± 1.9 | 28.5 ± 1.25 | 61.7 ± 3.11 | 249 ± 18 ** |
| Epidural XYL | 15 min. after | 35.8 ± 1.5 | 10.8 ± 0.9 | 17.0 ± 2.11 | 29.9 ± 1.9 | 31.33 ± 1.4 | 66.4 ± 4.33 | 206 ± 15 ** |
| | 30 min. after | 35.9 ± 2.0 | 11.25 ± 1.1 | 16.5 ± 1.80 | 31.5 ± 2.5 | 30.5 ± 2.0 | 66.8 ± 3.66 | 271 ± 28 ** |
| | 60 min. after | 36.0 ± 1.9 | 11.4 ± 0.8 | 17.11 ± 2.00 | 30.0 ± 1.25 | 27.2 ± 1.25 | 56.7 ± 2.77 | 281 ± 19 ** |
| | 90 min. after | 35.9 ± 1.6 | 11.8 ± 0.8 | 16.33 ± 1.00 | 31.5 ± 1.5 | 27.5 ± 0.9 | 53.6 ± 2.11 | 267 ± 21 ** |
| Systemic DETO | 15 min. after | 36.0 ± 2.0 | 11.0 ± 1.0 | 16.25 ± 1.66 | 32.0 ± 1.9 | 33.25 ± 2.5 | 58.12 ± 2.3 | 143 ± 11 * |
| | 30 min. after | 36.3 ± 2.25 | 10.8 ± 0.8 | 15.99 ± 1.80 | 31.6 ± 1.5 | 31.5 ± 1.8 | 48.17 ± 2.1 | 181 ± 19 * |
| | 60 min. after | 36.8 ± 1.9 | 11.25 ± 1.3 | 14.40 ± 0.98 | 32.1 ± 0.9 | 29.0 ± 1.5 | 49.31 ± 1.7 | 188 ± 31 * |
| | 90 min. after | 35.9 ± 1.44 | 11.25 ± 2.0 | 15.66 ± 1.33 | 30.6 ± 1.25 | 32.4 ± 2.0 | 50.66 ± 2.1 | 214 ± 60 ** |
| Epidural DETO | 15 min. after | 35.6 ± 1.6 | 11.5 ± 1.25 | 17.33 ± 1.80 | 33.75 ± 2.6 | 31.66 ± 1.2 | 60.11 ± 2.1 | 168 ± 43 * |
| | 30 min. after | 35.9 ± 1.9 | 10.22 ± 0.9 | 16.98 ± 1.77 | 31.66 ± 2.1 | 27.55 ± 0.9 | 53.7 ± 1.99 | 212 ± 51 ** |
| | 60 min. after | 36.0 ± 2.0 | 10.3 ± 1.11 | 16.0 ± 1.00 | 32.7 ± 1.99 | 29.6 ± 1.7 | 55.11 ± 2.2 | 186 ± 26 * |
| | 90 min. after | 35.8 ± 1.8 | 12.22 ± 2.1 | 15.66 ± 1.44 | 29.6 ± 2.0 | 30.5 ± 1.44 | 65.33 ± 2.1 | 191 ± 13 ** |

XYL, means Xylazine
Deto, means Detomidine

* Significant difference (at P< 0. 05).
** High significant difference (at P<0.01)