Effect of Administration of Crystalloid IV Fluids Preoperatively on Postoperative Pain[#]

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Abstract

Pain is a sensory and emotional experience that is influenced by physiologic, sensory, affective, cognitive, socio-cultural and behavioral factors. Postoperative pain is the commonest reason for delayed discharge and unanticipated hospital admission after ambulatory surgery. Our Objective is to test the hypothesis that administration of 2 ml/kg/hr preoperative IV fluids may attenuates postoperative pain.The study was carried out in the Baghdad Teaching Hospital, Al-Yarmok Teaching Hospital and Al-Karama Teaching Hospital from 12 May till 17 June 2009. The total number of patients was 120 (35 males and 85 females) with their age ranged between 10-90 years. The patients were divided into two groups according to administration of preoperative IV fluids, group A (65 patients) did not receive IV fluids and group B (55 patients) received IV fluids preoperatively. Regarding group A, the pain scale was ≤ 5 in 15.3% of patients, and it was >5 in 84.7% of patients and these results obtained within 0-5 hours after awaking from anesthesia. Whereas in group B, the pain scale was ≤5 in 29.09% of patients and was >5 in 70.9% of patients. We have demonstrated that the preoperative administration of 2ml/kg/hr IV fluids (crystalloid) to patients who had fasted from fluids decreased the severity of postoperative pain, and the need for postoperative analgesia. We report for the first time that administration of large volume preoperative IV fluids significantly reduce the incidence and severity of pain in patients at high risk for pain.

Key words: I.V fluids, Pain, Surgery.

تأثير اعطاء محاليل وريدية جزيئية قبل العملية على شدة الألم بعد العملية

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الخلاصة

الألم تجربةُ حسّيةُ وعاطفيةُ التي تُتأثّرُ بالعواملِ السلوكيةِ والثقافيةِ والاجتماعية والإدراكيةِ والعاطفيةِ والحسّيةِ والفسلجيةِ .الألم ما بعد الجراحة المسببُ المشتركُ للإطلاقِ المتأخرِ ودخولِ المستشفى الغير متوقّع بعد الجراحةِ المتنقلةِ.هدفنا كان لاختبار الفرضيةِ التي تفيد بأن اعطاء سوائل وريديةِ (بمقدار ٢مل\كغم\ساعة) قبل الجراحةِ قَدْ تُخفّفُ ألمَ ما بعد الجراحةَ. الدراسة نُفّذتْ في مستشفى بغداد التعليمي، مستشفى اليرموك التعليمي، ومستشفى الكرامة التعليمي مِنْ ١٢ حتى ١٧ يونيو/حزيرانِ ٢٠٠٩. العدد الكليّ للمرضى كَان ١٢٠ (٣٥ ذكر و٨٥ أنثى) بأعمار تَراوحتْ بين ١٠-٩٠ سَنَة. المرضى قُسّموا إلى مجموعتين المجموعةِ الف (٦٥ مريض) لَمْ تُستلمْ آي محاليل وريدية والمجموعة باء (٥٥) استلموا سوائل وريدية قبل الجراحة.بخصوص المجموعة الف ، مِقياس الألمَ كَانَ< ٥ في ٣ . ١٥ % مِنْ المرضى، وكَانَ> ٥ في ٨٤.٧ % مِنْ المرضى وهذه النَتائِج تم الحصول عليها خلال ٠ -٥ ساعات بعد الصَحوة مِنْ التخديرِ بينما في المجموعة باء ، مِقياس الألمَ كَانَ< ٥ في ٢٩.٠٩ % مِنْ المرضى وكَانَ> ٥ في ٧٠.٩ % مِنْ مرضى بَيّنَّا بأنَّ تقديم سوائل وريدية بكميات كبيرة ما قبل الجراحة للمرضى الذين عانوا من نقص بالسوائل قد قلل من شدَّةَ الألمِ ما بعد الجراحةِ، والحاجة لمسكنات الألم ما بعد الجراحةِ.نَذْكرُ للمرة الأولى بأنّ تقديم سوائل وريديةِ (بمقدار ٢مل\كغم\ساعة) ما قبل الجراحةِ تُخفّضُ بشكل ملحوظ حدوث الألم وشدَّةَ الألمِ في المرضى المعرضين للخطرِ العالي للألمِ.

الكلمات المفتاحية : محاليل وريدية ، الألم ، الجراحة

Introduction

Pain is a sensory and emotional experience that is influenced by physiologic, sensory, affective, cognitive, socio-cultural, and behavioral factors[(1)].Postoperative pain is the commonest reason for delayed discharge and unanticipated hospital admission after ambulatory surgery[(2)] .Pain causes an increase in the sympathetic response of the body with subsequent rises in heart rate, cardiac work and oxygen consumption. Prolonged pain can reduce physical activity and lead to venous stasis and an increased risk of deep vein thrombosis and consequent pulmonary embolism. In addition, there can be widespread effects on gut and urinary tract motility which may lead, in turn, to postoperative ileus, nausea, vomiting and urinary retention. These problems are unpleasant for the patient and may prolong hospital stay[(3)].

Based on oral presentation in the eighth scientific conference of the College of Pharmacy /University of Baghdad held in 23-24 February 2011.

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Received : 5/3/2011
Accepted : 7/1/2012

The site of the surgery has a profound effect upon the degree of postoperative pain a patient may suffer. Operations on the thorax and upper abdomen are more painful than operations on the lower abdomen which, in turn, are more painful than peripheral operations on the limbs. However, any operation involving a body cavity, large joint surfaces or deep tissues should be regarded as painful. In particular, operations on the thorax or upper abdomen may produce widespread changes in pulmonary function, an increase in abdominal muscle tone and an associated decrease in diaphragmatic function. The result will be an inability to cough and clear secretions which may lead to lung atelectasis (collapse of lung tissue) and pneumonia. Matters are made worse by postoperative bowel distension or tight dressings [(1)].Post-operative pain increases the possibility of post-surgical complications, raises the cost of medical care, and most importantly, interferes with recovery and return to normal activities of daily living. Management of post-surgical pain is a basic patient right. When pain is controlled or removed, a patient is better able to participate in activities such as walking or eating, which will encourage his or her recovery. Patients will also sleep better, which aids the healing process[(4)]. Preoperative correction of intravascular volume deficits effectively reduces postoperative pain in high risk patients presenting for ambulatory surgery[(5)].Studies clearly demonstrate the potential for large volume IV fluids (2ml/kg/hr crystalloid) to markedly reduce postoperative pain. 2ml/kg/hr IV fluids (crystalloid) markedly reduced both the mean severity of pain and the worst pain scores in these patients, and the need for supplemental parenteral opioid and oral analgesia[(5)].They demonstrated a marked trend toward less opioid and nonsteroidal antiinflammatory use in the patients who received 2ml/kg/hr IV fluids[(6)].A further novel finding is that the treatment effect was prolonged, and was still present at 72 hours postoperatively[(5)].In fact, 2ml/kg/hr crystalloid IV fluids significantly reduced the combined need for analgesic and antiemetic medication in those studies[(7)].Other study reported that few patients who received preoperative IV fluids complained of moderate or severe postoperative pain[(8)].In summary, the potential for preoperative IV fluid regimens to modulate the severity of postoperative pain and analgesic requirements and the demonstration of the analgesic potential of preoperative large volume crystalloid IV fluids is clear[(9)].

Methodology

The study was carried out in the Baghdad Teaching Hospital, Al-Yarmok Teaching Hospital and Al-Karama Teaching Hospital from 12 May till 17 June 2009.The total number of patients was 120 (35 males and 85 females) with their age ranged between 10-90 years.Patients were divided into two groups according to the administration of preoperative IV fluids, group A (65 patients) did not receive crystalloid IV fluids and group B (55 patients) received crystalloid IV fluids preoperatively.Patients were referred to the surgical wards and underwent different types of laparotomies: intestinal obstructions, caesarian sections, appendicectomies… others). All patients were suffering from postoperative pain.For each patient a short clinical notes were recorded which include: type and duration of surgery, type and quality of IV fluids prescribed, associated diseases, drugs used, type and dose of postoperative analgesia.Every patient was interrogated to specify the degree of postoperative pain according to the comparative pain scale of the Mayo Clinic[(10)].Some patients were difficult to communicate with, while others were uncooperative because of the surgery and some tried to exaggerate the pain which may affect scoring of pain.This needed an extra work to explain the type of pain and to get the exact description of the pain related to the scale used.Pain was measured within 5 and 24 hr after the patient was fully awake from anesthesia according to the comparative pain scale of the Mayo Clinic[(10)].Statistics were performed using standard statistical program (SPSS Inc, version 15).

Demographic data were analyzed by using Chi-square test. All P values ≤ 0.05 were considered significant.

Results

Most of the patients in group A (who did not receive preoperative IV fluids) underwent appendectomy, cholecystectomy and Caesarian section, whereas, most of the patients in group B (who received preoperative IV fluids) underwent Caesarian section and correcting intestinal obstruction, (Table 1).This is important regarding the severity of pain. Regarding group A, the pain scale was ≤ 5 in 15.3% of patients, and it was >5 in 84.7% of patients and these results obtained within 0-5 hours after awaking from anesthesia.Whereas in group B, the pain scale was ≤ 5 in 29.09% of patients and was >5 in 70.9% of patients, (Table 2). Table 3 shows that only 10.1% of patients in group A did not use postoperative analgesia while 90% of them used either

tramadol (77.9%) or diclofenac sodium (22.0%). Whereas 18.18% of patients in group B did not use postoperative analgesia while 81.82% of patients used either tramadol (58.18%) or diclofenac sodium (23.64%).The results in table 3 show that the use of analgesics was significantly reduced ($p<0.05$) in group B when compared with group A and this reflects that pain is less in group B when compared with group A. In group A 64% of the patients have no associated disease, and the rest (36%) with associated disease mainly hypertension alone (56%) and other have hypertension with ischemic heart disease, or with diabetes mellitus, in addition to diabetes mellitus or asthma alone, (Table 4). Whereas 65% of the patients in group B have no associated disease, and (35%) with associated disease, hypertension (52%) and other have hypertension with diabetes mellitus, or diabetes mellitus, anemia, or asthma alone. In both groups (84%) of the patients were nonsmoker. Seventy percent of the patients were females. Eighty percent of the patients underwent long surgeries lasting more than one hr. Table 5 demonstrates that the overall incidence of pain in the 1st 5 hours was significantly ($p<0.05$) reduced in group B compared with patients in group A.

Table 1: Relation between type of surgery and number of patients in group A (who did not receive preoperative IV fluids) and B (who received preoperative IV fluids)

Type of surgery	No .of patients in group A	% .of patients in group A	No. of patients in group B	% .of patients in group B
Colectomy	1	1.5		
Appendectomy	19	29.2	3	5.4
Cholecystectomy	11	16.9	4	7.2
Ovarian cyst	1	1.5		
Hysterectomy	4	6.1	2	3.6
Perforated ulcer	1	1.5	4	7.2
Splenectomy	2	3.0		
Intestinal obstruction	3	4.6	15	27.27
Hernia	5	7.9	2	3.6
Caesarian section	15	23.0	15	27.27
Pyeloplasty	1	1.5		
Perforated colostomy	1	1.5		
Hydatid cyst	1	1.5	2	3.6
Colostomy			1	1.8
Gastrectomy			2	3.6
Curitage			1	1.8
Removal of anus			1	1.8
Peritoneal wash			1	1.8
Closure jejunectomy			1	1.8
Abdominal trauma			1	1.8

Table 2: Postoperative pain within 5 hours in group A and B

Pain scale of the Mayo Clinic[10]	Number of patients group A	% of patients group A	Number of patients group B	% of patients group B
Less or equal 5	10	15.3	16	29.09
More than 5	55	84.6	39	70.9
Total	65	100	55	100

Table 3 : Use of analgesics in group A and B

Use of analgesics	Number of patients group A	% of patients group A	Number of patients group B	%of patients group B
Without analgesic	6	10.1	10	18.18
Tramadol	46	77.9	32	58.18
Diclofenac sodium	13	22.0	13	23.64
Total	65	100	55	100

Table 4: Comparison between the presence of associated diseases in group A and B.

Associated diseases	% of patients in group A	%of patients group B
Without an associated disease	64	65
With an associated disease	36	35

Table 5: Comparison between the incidence of pain within 1st 5 hours in group A and B.

Pain scale	Group A	Group B
Less than 5	23%	29%
More than 5	77%	70.9%

Discussion

Postoperative pain continues to be a common and distressing complication of surgery. We have demonstrated that the preoperative administration of 2ml/kg/hr crystalloid IV fluids to patients who had fasted from fluids decreased the severity of postoperative pain, so minimizes the need for postoperative analgesia, by correction of intravascular volume deficit[5].The study clearly demonstrates the potential for 2ml/kg/hr crystalloid IV fluids which markedly reduce postoperative pain, and the need for supplemental parenteral opioid and oral analgesia, this fact was supported by other studies like that done by Ali et al [6].A further finding is that the treatment effect was prolonged for 72 hours postoperatively. In fact, a close examination of other studies of preoperative fluid regimens does reveal evidence for reduced postoperative pain with 2ml/kg/hr preoperative IV fluid therapy, although this has received little attention. Ali et al demonstrated a marked trend toward less opioid and nonsteroidal antiinflammatory use in the patients who received the 2ml/kg/hr IV fluids[6]. In a study done by Yogendran et al, concluded that less patients in the large volume group required postoperative morphine [9]. Cook et al reported less codeine and acetaminophen use in the large volume group of their study[7]. It is reported that large volume IV fluids significantly reduced the combined need for analgesic and antiemetic medication[7]. Ooi et al [8] reported that few patients who received preoperative IV fluids complained of moderate or severe postoperative pain. In the study by Moretti et al comparing the effect of crystalloids and colloids, colloid was used for intra-operative resuscitation in 90 patients undergoing elective non-cardiac surgery; they found that the incidence of nausea and vomiting, severe pain, periorbital oedema, double vision and the use of rescue antiemetics was significantly reduced in patients receiving colloids[11].The finding that large volume IV fluids decreased postoperative pain and opioid requirements raised the possibility that this could alone account for the decreased postoperative nausea and vomiting[12]. And this in turn will reduce the postoperative pain because it will reduce the tension and abdominal muscles produced by the vomiting. Since women experienced more severe postoperative pain and required greater dose of analgesics than men in the immediate postoperative period, as reported by Aubran in 2005, therefore we decided that female patients in this study are greater in number than male patients in order to achieve better estimation of the results[13]. In addition to the effects of analgesics and IV fluids for postoperative pain, preoperative nursing intervention for pain has positive effect for patient undergoing abdominal surgery[14].In summary, the potential for preoperative IV fluid regimens to modulate the severity of postoperative pain and analgesic requirements is clear. The current study provides clear demonstration of the analgesic potential of preoperative large volume (2ml/kg/hr) IV fluids. The mechanism underlying these analgesic effects remains to be determined. In Conclusion the study reports for the first time the potential for large volume (2ml/kg/hr) preoperative IV administration of a balanced salt solution to significantly reduce the incidence and severity of pain in patients at high risk for pain. The potential for large volume (2ml/kg/hr) IV fluids to produce a sustained reduction in pain is novel due to its ability to reduce postoperative pain and opioid and simple analgesic requirements. We recommend the administration of a volume of 2 mL/kg for every hour of fasting to high risk patients undergoing ambulatory surgical procedures.

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