Biomedical Research 2017; 28 (16): 7153-7156 *ISSN 0970-938X*
www.biomedres.info

The clinical effects of multi-modal analgesia on postoperative pain and nosocomial infection in patients with lower limb fracture.

Hong-Bo Li[1], Shou-Hui Xu[2*]

[1]Department of Operating Room, the First Hospital of Jilin University, Changchun, Jilin, PR China

[2]Department of Sports Medicine, the First Hospital of Jilin University, Changchun, Jilin, PR China

Abstract

Background: Our objective is to explore the effect of multi-modal analgesia on postoperative pain and nosocomial infection in patients with lower limb fracture.
Methods: 84 patients with lower limb fracture were selected. The Visual Analogue Scale (VAS) scores, adverse reactions and the incidence rates of nosocomial infection after surgery were observed and compared.
Results: The VAS scores at 1 h, 2 h, 24 h, 2 d and 3 d after surgery in the control group were 7.5 ± 0.32, 5.4 ± 0.38, 3.8 ± 0.42, 1.8 ± 0.54 and 1.5 ± 0.25 respectively, which were 6.3 ± 0.28, 3.8 ± 0.29, 2.4 ± 0.48, 1.3 ± 0.32, 1.1 ± 0.36 in the observation group respectively, there were significant difference between two groups (p<0.05). The incidence rates of postoperative adverse reactions such as respiratory depression, headache, nausea, vomiting and somnolence was 45.2% in the control group and 19.1% in the observation group, there was significant difference between two groups (p<0.05). The rates of nosocomial infection was 40.4% in the control group and 14.4% in the observation group, there was significant difference between two groups (p<0.05).
Conclusions: In conclusion, the effect of multi-modal analgesia is significantly better than the single conventional analgesia mode in patients with lower limb fracture.

Keywords: Multi-modal analgesia, Patients with lower limb fracture, Postoperative pain, Nosocomial infection.

Accepted on July 24, 2017

Introduction

Pain is a common problem that patients in Department of Orthopaedics have to face [1-4]. If the acute pain stimulus is not effectively controlled, it will develop to more severe chronic pain which affects the normal life of patients [5,6]. There is obvious pain in patients who receive surgery of lower limb fracture, and usually only opioids are used to treat surgical pain. However, opioids will cause severe neural side effect [7-10]. As a novel analgesia mode, multi-modal analgesia has been widely applied and has shown good effect clinically [11-13]. Hospital is a special place in which patients carry a large number of pathogenic bacteria with strong infectiousness. If the infection is not actively treated, it will cause nosocomial infection, and even threaten the life and health of patients [14,15]. Thus, the prevention and treatment of nosocomial infection are very important. In this study, 84 patients with lower limb facture admitted between May 2011-June 2012 received different analgesia modes, and the analgesia effect and nosocomial infection of two modes were compared.

Materials and Methods

Clinical data

84 patients with lower limb facture between May 2011-June 2012 were selected. The age was 32-75 y, the average age was 46.4 ± 51.8 y, and the median age was 48.6 y. There were 58 male cases and 26 female cases. The patients were divided into control group and observation group according to the analgesia mode in lower limb surgery with 42 cases in either group. In the control group, the age was 33-75 y, the average age was 46.6 ± 5.58 y, and there were 30 male cases and 12 female cases. In the observation group, the age was 32-74 y, the average age was 45.1 ± 4.69 y, and there were 28 male cases and 14 female cases. The general data of two groups were not significantly different (p>0.05).

Methods

The patients in the control group received conventional analgesia mode: the patients were administrated with morphine or opioid drug for analgesia. The patients in the observation group received multi-modal anesthesia: first the analgesia knowledge was introduced to patients to comfort them, and a

comfortable environment was created for patients, during examination and nursing the stimulus was avoided as much as possible; analgesia drug: multiple target point drugs were administrated before, intra and after surgery instead of drug administration according to need.

Indicators

The Visual Analogue Scale (VAS) scores, adverse reactions (nausea, somnolence, respiratory depression, headache and vomiting) and the incidence rates of nosocomial infection at 1 h, 2 h, 24 h, 2 d and 3 d after surgery in the control group and observation group were observed and compared.

Criteria

The scoring of postoperative pain was referred to the VAS criteria; the score range was 0-10 which represents different pain degrees [16].

Statistical analysis

SPSS16.0 was used to analyze the data. The enumeration data were analyzed by X^2 test, the measurement data were analyzed by t test. P<0.05 was considered as statistically significant.

Results

Comparison of postoperative pain scores between two groups

The VAS scores at 1 h, 2 h, 24 h, 2 d and 3 d after surgery in the control group were significantly higher than the observation group respectively, there was significant difference between two groups (p<0.05), as shown in Table 1.

Table 1. *Comparison of postoperative pain scores between two groups.*

Group	Control group	Observation group	t	P
Total number (n)	42	42		
1 h after surgery	7.5 ± 0.32	6.3 ± 0.28	-18.29	P<0.05
6 h after surgery	5.4 ± 0.38	3.8 ± 0.29	-21.69	P<0.05
24 h after surgery	3.8 ± 0.42	2.4 ± 0.48	-14.23	P<0.05
2 d after surgery	1.8 ± 0.54	1.3 ± 0.32	-5.16	P<0.05
3 d after surgery	1.5 ± 0.25	1.1 ± 0.36	-5.91	P<0.05

Comparison of surgical adverse events between the two groups

The incidence rates of postoperative adverse reactions such as respiratory depression, headache, nausea, vomiting and somnolence in the control group were significantly higher than the observation group, there was significant difference between two groups (p<0.05), as shown in Table 2.

Comparison of nosocomial infection between two groups

The nosocomial infection sites in two group were mainly respiratory tract, urinary tract, incision, skin and lung, the infection rates of above sites in the control group were significantly higher than the observation group, there was significant difference between two groups (p<0.05), as shown in Table 3.

Discussion

In the recent years, as the increase of activity range and traffic accident, the incidence rate of lower limb fracture is increasing year by year [17,18]. The most common method to treat lower limb fracture is surgery, which has high invasiveness, causes severe trauma and big blood loss [19,20]. Thus, the rate of infection is increased. Hospital is a place that pathogenic bacteria gather, and postoperative weakness, poor immunity and haemorrhage in patients even increase the rate of nosocomial infection [21]. Nosocomial infection can aggravate the condition, and patients have to bear more psychological and economic burden. Thus, infection control is significant in treating lower limb fracture patients. Due to the big invasiveness and surgical wound in lower limb fracture surgery, another common concern in fracture patients is pain [22]. If the pain is not properly controlled, the pathological change possibility of central nervous system is increased, which increases the pain sense during surgery and after surgery and decreases the satisfaction degree of patients to the surgery [23].

Table 2. *Comparison of surgical adverse events between the two groups.*

Group	Control group		Observation group		X^2	P
Total number (n)	42		42			
	Number	Proportion	Number	Proportion		
Respiratory depression	2	4.8	0	0		
Headache	3	7.1	1	2.4		
Nausea	2	4.8	1	2.4		

Vomiting	4	9.5	2	4.8		
Somnolence	8	19	5	9.5		
The total incidence rate	45.2		19.1		-12.36	P<0.05

Table 3. *Comparison of nosocomial infection between two groups.*

Group	**Control group**		**Observation group**		**X^2**	**P**
Total number (n)	**42**		**42**			
	Number	**Proportion**	**Number**	**Proportion**		
Respiratory tract infection	5	11.9	2	4.8		
Urinary tract infection	3	7.1	1	2.4		
Infection of incision	4	9.5	2	4.8		
Skin infection	3	7.1	1	2.4		
Lung infection	2	4.8	0	0		
The total incidence rate of infection	40.4		14.4		-16.98	P<0.05

In this study, 84 patients with lower limb fracture received conventional analgesia mode and multi-modal analgesia during surgery were studied to observe the analgesia effects of two modes and the effects on nosocomial infection. As shown in the results, the postoperative VAS score in multi-modal analgesia group was significantly lower than the conventional analgesia mode group, indicating that the analgesia effect of multi-modal analgesia is significantly better than the conventional analgesia mode. In the adverse reaction results, the incidence rate of adverse reactions in the multi-modal analgesia group was significantly lower than the conventional analgesia group. Analgesia is a complex process, which is a process of nerve conduction and transmission [24,25]. Single conventional analgesia has poor analgesia effect and causes adverse reactions [26,27]. However, multi-modal analgesia has various patterns and mechanisms, which have different target points and time phases [11,13]. Thus, analgesia drug can increase the analgesia effect and effectively reduce the adverse reaction by targeting on different points and by the synergistic effect [11]. In the nosocomial infection results, the rate of nosocomial infection in single analgesia mode group was 40.4% which was significantly higher than 14.4% in multi-modal analgesia group. In the results of nosocomial infection sites, respiratory tract and incision were the main postoperative infection sites in patients with lower limb fracture, which was in accordance with the reference. It indicates that multi-modal analgesia has significant effect in preventing and treating nosocomial infection in patients with lower limb fracture.

In conclusion, the effect of multi-modal analgesia is significantly better than the single conventional analgesia mode in patients with lower limb fracture, the adverse reactions are also less than the single conventional analgesia mode. Furthermore, multi-modal analgesia can effectively prevent nosocomial infection. It is worthy of further research on multi-modal analgesia.

Conflicts of Interest

The authors have declared that no competing interests exist.

References

1. Mehta SP, MacDermid JC, Richardson J, MacIntyre NJ, Grewal R. Baseline pain intensity is a predictor of chronic pain in individuals with distal radius fracture. J Orthop Sports Phys Ther 2015; 45: 119-127.
2. Boccio E, Wie B, Pasternak S, Salvador-Kelly A, Ward MF, D'Amore J. The relationship between patient age and pain management of acute long-bone fracture in the ED. Am J Emerg Med 2014; 32: 1516-1519.
3. Roh YH, Lee BK, Noh JH, Baek JR, Oh JH, Gong HS, Baek GH. Factors associated with complex regional pain syndrome type I in patients with surgically treated distal radius fracture. Arch Orthop Trauma Surg 2014; 134: 1775-1781.
4. Wang Y, Zhang R, Xie J, Lu J, Yue Z. Analgesic activity of catalpol in rodent models of neuropathic pain, and its spinal mechanism. Cell Biochem Biophys 2014; 70: 1565-1571.
5. Park KD, Jee H, Nam HS, Cho SK, Kim HS, Park Y, Lim OK. Effect of medial branch block in chronic facet joint pain for osteoporotic compression fracture: one year retrospective study. Ann Rehabil Med 2013; 37: 191-201.
6. Kim HN, Park YJ, Kim GL, Park YW. Arthroscopy combined with hardware removal for chronic pain after ankle fracture. Knee Surg Sports Traumatol Arthrosc 2013; 21: 1427-1433.
7. Bostick GP, Toth C, Carr EC, Stitt LW, Morley-Forster P, Clark AJ, Lynch M, Gordon A, Nathan H, Smyth C, Ware MA, Moulin DE. Physical functioning and opioid use in patients with neuropathic pain. Pain Med 2015; 16: 1361-1368.

8. Bot AG, Bekkers S, Arnstein PM, Smith RM, Ring D. Opioid use after fracture surgery correlates with pain intensity and satisfaction with pain relief. Clin Orthop Relat Res 2014; 472: 2542-2549.
9. Strike SA, Sieber FE, Gottschalk A, Mears SC. Role of fracture and repair type on pain and opioid use after hip fracture in the elderly. Geriatr Orthop Surg Rehabil 2013; 4: 103-108.
10. Chrastil J, Sampson C, Jones KB, Higgins TF. Evaluating the affect and reversibility of opioid-induced androgen deficiency in an orthopaedic animal fracture model. Clin Orthop Relat Res 2014; 472: 1964-1971.
11. Newton-Brown E, Fitzgerald L, Mitra B. Audit improves emergency department triage, assessment, multi-modal analgesia and nerve block use in the management of pain in older people with neck of femur fracture. Australas Emerg Nurs J 2014; 17: 176-183.
12. Duellman TJ, Gaffigan C, Milbrandt JC, Allan DG. Multi-modal, pre-emptive analgesia decreases the length of hospital stay following total joint arthroplasty. Orthopedics 2009; 32: 167.
13. Turan I, Assareh H, Rolf C, Jakobsson J. Multi-modal-analgesia for pain management after Hallux Valgus surgery: a prospective randomised study on the effect of ankle block. J Orthop Surg Res 2007; 2: 26.
14. Hälleberg Nyman M, Johansson JE, Persson K, Gustafsson M. A prospective study of nosocomial urinary tract infection in hip fracture patients. J Clin Nurs 2011; 20: 2531-2539.
15. Guerado E, Cano JR, Cruz E, Benitez-Parejo N, Perea-Milla E. Role of mental disorders in nosocomial infections after hip fracture treatment. Interdiscip Perspect Infect Dis 2010; 2010: 615604.
16. Kliger M, Stahl S, Haddad M, Suzan E, Adler R, Eisenberg E. Measuring the intensity of chronic pain: are the visual analogue scale and the verbal rating scale interchangeable? Pain Pract 2015; 15: 538-547.
17. Saita Y, Ishijima M, Mogami A, Kubota M, Baba T, Kaketa T, Nagao M, Sakamoto Y, Sakai K, Kato R, Nagura N, Miyagawa K, Wada T, Liu L, Obayashi O, Shitoto K, Nozawa M, Kajihara H, Gen H, Kaneko K. The fracture sites of atypical femoral fractures are associated with the weight-bearing lower limb alignment. Bone 2014; 66: 105-110.
18. Rokhtabnak F, Zamani MM, Kholdebarin A, Pournajafian A, Ghodraty MR. Anesthetic management for lower limb fracture in severe aortic valve stenosis and fat embolism: a case report and review of literature. Anesth Pain Med 2014; 4: e13713.
19. Forsberg A, Söderberg S, Engström Å. People's experiences of suffering a lower limb fracture and undergoing surgery. J Clin Nurs 2014; 23: 191-200.
20. Ponce-Monter HA, Ortiz MI, Garza-Hernández AF, Monroy-Maya R, Soto-Ríos M, Carrillo-Alarcón L, Reyes-García G, Fernández-Martínez E. Effect of diclofenac with B vitamins on the treatment of acute pain originated by lower-limb fracture and surgery. Pain Res Treat 2012; 2012: 104782.
21. Hälleberg Nyman M, Johansson JE, Persson K, Gustafsson M. A prospective study of nosocomial urinary tract infection in hip fracture patients. J Clin Nurs 2011; 20: 2531-2539.
22. Cruz E, Cano JR, Benitez-Parejo N, Rivas-Ruiz F, Perea-Milla E, Guerado E. Age as a risk factor of nosocomial infection after hip fracture surgery. Hip Int 2010; 20: 19-25.
23. Hozumi J, Sumitani M, Yozu A, Tomioka T, Sekiyama H, Miyauchi S, Yamada Y. Oral local anesthesia successfully ameliorated neuropathic pain in an upper limb suggesting pain alleviation through neural plasticity within the central nervous system: A case report. Anesthesiol Res Pract 2011; 2011: 984281.
24. Lim G, Kim H, McCabe MF, Chou CW, Wang S, Chen LL, Marota JJ, Blood A, Breiter HC, Mao J. A leptin-mediated central mechanism in analgesia-enhanced opioid reward in rats. J Neurosci 2014; 34: 9779-9788.
25. Luo D, Wang X, He J. A comparison between acute pressure block of the sciatic nerve and acupressure: methodology, analgesia, and mechanism involved. J Pain Res 2013; 6: 589-593.
26. Poonai N, Paskar D, Konrad SL, Rieder M, Joubert G, Lim R, Golozar A, Uledi S, Worster A, Ali S. Opioid analgesia for acute abdominal pain in children: A systematic review and meta-analysis. Acad Emerg Med 2014; 21: 1183-1192.
27. Stein C, Jagla C. Methylnaltrexone and opioid analgesia. Pain 2014; 155: 2722-2723.

*Correspondence to

Shou-Hui Xu

Department of Sports Medicine

The First Hospital of Jilin University

Changchun

Jilin

PR China