

Investigation and Analysis of Sharp Injury of Medical Staff in Ophthalmic Hospital and Prevention Measures

Jing Lin¹, Hairong Zhang^{1*}, Xiaoyan Huang¹, Huiming Xiao¹, Mingse Lin¹

¹ Comprehensive Second Area of Zhongshan Ophthalmic Center, First Affiliated Hospital of Sun Yat-Sen University, Guangzhou, Guangdong, 510060, P.R.China

* Correspondence should be addressed to Hairong Zhang (zhanghairong@gzzoc.com)

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Abstract

This paper summarized the characteristics of sharp injuries of medical staff in ophthalmology hospitals, and analyzed the risk factors of sharp injuries with existing weak links, thus providing basis for the development of preventive measures. The data of 139 sharp injury cases reported in January 2009 to December 2013 were sorted and analyzed. As a result, the incidences of sharp injuries from top to bottom were 70.5% of doctors, 22.3% of nurses, 5% of hygienists and 2.2% of laborers. The main injury implements were syringes and stab knife of ophthalmic surgery which mainly occurs in surgical operation and postoperative equipment arrangement, etc. The places of sharp injury occurrence include operating room with a proportion of 72.7%, ward of 16.5%, supply room of 3.6% and laboratory of 2.2%. Aiming at the characteristics of ophthalmic specialist sharp injuries, it is necessary to strengthen the precautionary measures for relevant personnel in special links, regulate the delivery, use and disposal processes of sharp devices, so as to carry out targeted training.

Keywords Medical staff; Sharp injury; Occupational exposure; Prevention measures

1. Introduction

Due to the special nature of working places and work, the medical staff bear huge occupational exposure risk and pressure in their daily work. Besides, as sharp injury is the main occupational factor causing blood transmitted diseases among medical staff, the incidence of infection among medical staff due to occupational exposure caused by the sharp instruments polluted by blood transmitted diseases has been constantly increasing. In this paper, the sharp injury data reported eye specialist hospital in recent five years was analyzed retrospectively to find out the weak links with incidence of sharp injury so as to make corresponding prevention measures, which was of positive reference significance to prevention of sharp injuries among clinical staff of ophthalmology.

2. Materials and methods

2.1 Data

From January 2009 to December 2013, there were a total of 139 registered cases of sharp injury, covering doctors, nurses, workers and laboratory staff.

2.2 Methods

The 139 cases of sharp injury reports from January 2009 to December 2013 were sorted and analyzed.

Then, they were classified according to occupations of the wounded, injury implement, occurrence places, links of injury occurrence, occupational exposure types and treatment after occurrence of sharp injury and follow-up, etc.

3. Results

3.1 Composition ratio of personnel suffering sharp injury

Among 139 cases of sharp injuries, the main wounded was 99 cases of doctors, accounting for 71.2%. The next was 30 cases of nurses, occupying for 21.6%. The specific proportion is shown in Table 1.

Table 1 Proportion of personnel suffering sharp injury

Occupation	Doctor	Nurse	Worker	Laboratory personnel	Total
Number of people	99	30	7	3	139
Composition ratio(%)	71.2	21.6	5	2.2	100

3.2 Composition ratio of the types of injury implement

With regard to the injury implements, there were mainly 59 cases of injection needle accounting for 42.4%, 27 cases of surgical puncture knife accounting for 19.4%, 23 cases of suture needle accounting for 16.6% and 14 cases of scalp needle accounting for 10.1%. See Table 2.

Table 2 Composition ratio of injury implements of sharp injury

Types of sharp instrument	Injection needle	Surgical puncture knife	Suture needle	Scalp needle	Surgical instruments	Blood drawing needle	Ampoule	Total
Times of injury	59	27	23	14	12	3	1	139
Composition ratio	42.4	19.4	16.6	10.1	8.6	2.2	0.7	100



3.3 Main parts of the sharp injury occurred

Surgical operation, postoperative equipment finishing, needle and back to the needle cap, puncture knife for the sharp injury occurred in the main links, see Table 3.

3.4 Places with occurrence of sharp injuries

It's the operating room that most sharp injuries occurred, accounting for 71.9%. And it is followed by the ward. See Table 4.

Table 3 Sharp operation of the sharp operation of the ratio

Injury links	During surgery	Postoperative instrument arrangement	Withdrawal of needles	Putting back needle cap and stab knife	Instrument delivery	Accidental puncture wound	Puncture injection	Instrument recycling and classification	Instrument cleaning	Total
Injury times	55	21	16	14	10	9	7	5	2	139
Composition ratio (%)	39.6	15.1	11.5	10.1	7.2	6.5	5.0	3.6	1.4	100

Table 4 Composition ratio of places with occurrence of sharp injuries

Places with occurrence of injury	Operating room	Ward	Cleaning room of supply house	Auxiliary examining room	Laboratory	Outpatient department	Total
Times of injury	100	23	5	5	3	3	139
Composition ratio (%)	71.9	16.5	3.6	3.6	2.2	2.2	100

3.5 Occupational exposure types and treatment of sharp injuries

Among the 139 cases of occupational exposure, the first four items of 35.3% of the patients having contacted with the injury implement were all negative before operation. While the sharp instruments polluted by

the body fluid of HBV-infected patients accounted for 42.4%; those who did not deal with wounds after occupational exposure accounted for 2.9% and the patients who carried out on-standard treatment made up 13.7%. Details are shown in Table 5 and Table 6 below.



Table 5 Composition ratio of occupational exposure types of sharp injuries

Types of disease of occupational exposure	HBV	Syphilis	HCV	HIV	HBV&Syphilis	The above four negative items	Unable to verify	Total
Times of injury	59	5	5	0	1	49	20	139
Composition ratio(%)	42.4	3.6	3.6	0	0.7	35.3	14.4	100

Table 6 Treatment of sharp injuries

	Local wound treatment		Preventive medication		General hospital admission		
	No treatment	With treatment	Y	N	Y	N	
		Standard treatment	28	111	23	116	
	4	116	19				
Total(%)	2.9	83.4	13.7	20.1	79.9	16.5	83.5

4. Discussions

4.1 Population distribution and injury implement

The survey results show that the sharp injury mainly occurs among doctors accounting for 71.2%, which is inconsistent with the report of Yuchan Liang et al ^[1-7]. According to their reports, the main population suffering sharp injury is the nurses. However, the reports of Haiqin Zhu et al indicate that the high-risk population suffering from sharp injury in ophthalmic operating room is micro-equipment cleaning staff ^[8], which is different from results of this survey. Treatment of eye diseases is mainly given priority to surgical treatment. The operation of surgeons is basically performed under the microscope, with a narrow space and small field of vision. As the micro-surgical instruments are mainly fine and sharp equipment, the syringes, puncture knives, puncture needles and suture needles are frequently used in operation. What's more, there are dozens of surgical blades and surgical puncture knives used for incision. Compared with the comprehensive hospital, the Hospital has more fine and sharp instruments. Therefore, this

survey shows that the main population suffering from sharp injuries is doctors accounting for 71.2% of the total population of sharp injuries. And the top three sharp implements include needle with 59 cases accounting for 42.4%, surgical puncture knife with 27 cases accounting for 19.4%, and suture needle with 23 cases accounting for 16.6%.

4.2 Links and places with occurrence of sharp injuries

The occurrence of most of the sharp injuries is related with surgery and more than two-thirds occur in the operating room. For one thing, there exists particularity of ophthalmic surgical instruments and the fact that most of the surgeries require the use of microscopes. For another, almost all of the retina and vitreous surgeries are performed in darkroom environment for making surgical operation more accurate and smooth. As a result, the risk of sharp injury occurrence is increased. In the course of surgery, the surgeons as well as their assistants



mainly operate under the microscope. Thus, sharp injuries are more likely to occur on the doctors when touching the puncture knife, puncture needle, blade, microscopic devices and transmission equipment out of vision. What's worse, some sharp parts of one-time operating puncture knives are not equipped with independent protective covers, which greatly increase the risk of sharp injury. Sharp injury also easily occurs in links such as postoperative needle and catheter withdrawal, recovery and arrangement of fine and sharp equipment. In ward, it easily occurs because of misoperations of nurses including injection, needle withdrawal and nonstandard needle treatment of the nurses, which reflects that the nurses lack awareness of preventing occupational exposure^[9] and there is not enough training. Thus, it is necessary to strengthen the training on standard operation for nurses to deal with sharp instruments.

4.3 Types and treatment of occupational exposure

As can be seen from Table 5 and Table 6, there are 70 cases of sharp instruments polluted by blood transmitted diseases, accounting for 50.4% of sharp injuries. And the standard treatment of local wounds after occupational exposure is still unsatisfactory with only a small part of people receiving treatment and preventive medication. Thus, it can be seen that the medical staff suffer from extremely high risk of infection after being wounded by sharp instruments. In this survey, 14.4% of the personnel had difficulty in receiving preventive medication because of being unable to determine the injury implements, which resulted in considerable pressure on them. In addition, it is clearly reflected from the data that the information traceback data of the survey is incomplete, so the analysis argues that it is related to the understanding of the injured and the fact of being uninfected.

5. Preventive measures

5.1 To strengthen the training of medical personnel

It's necessary to strengthen occupational safety training and education so as to improve the awareness of occupational exposure prevention, which are important factors of reducing the sharp injuries. The Infection Management Department of the Hospital brought knowledge of occupational exposure and protection into the required pre-job training for new staff, refresher physicians and graduates, developed plans of training and assessment related to occupational safety protection, occupational exposure and other aspects, and provided regular education and training courses in the hospital throughout the year. In order to alert all the staff to pay attention to prevention of sharp injuries, the occurrence of sharp injuries among staff would be regularly reported in the whole hospital. Besides, it's required that the Departments should regularly organize medical staff to review occupational safety-related knowledge and carry out assessment. Especially, there were education with multiple forms and multiple aspects for the surgeons, assistants and medical workers in surgical departments, training model of combining theory with actual operation for the newly recruited surgical staff and interpretation the characteristics and application methods of specialist surgical instruments, the location of sharp instruments and standard treatment process of preventing puncture and occupational exposure. It's a must that the relevant personnel should pass the assessment before performing clinical operation.

5.2 To standardize the delivery, use and disposal of sharp instruments

The occurrence of sharp injury occurs to a large extent depends on the frequency of contacting with the sharp instruments. At the same time, the occurrence of sharp injuries is related to careless working, unskilled technology and relaxed implementation

of operating procedures and weak self-protection awareness. Therefore, as important links of ensuring occupational, it's vital to strengthen the training of safe operation for nurses, physicians, especially graduate students and standardizing operation. Moreover, it is necessary to standardize the procedure for medical staff to handle the sharp instruments, particularly the training for personnel related to surgery. And the surgical instruments should be delivered in the form of taking up a pen. During delivery, the tail of the instrument should be toward the receivers. After taking back surgical knife, surgical blade and other sharp instruments, the surgical assistants should lay the instruments back to the instrument box or protective box to fixed position after pretreatment. As for the surgical needle, it should be timely inserted into the needle plate for fixation after using. During postoperative instruments arrangement, direct grabbing of syringe needle, needle, surgical blade, puncture knife point should be forbidden.

5.3 To promote anti-puncture products

The use of the closed anti-puncture indwelling needles with advantages of common closed indwelling needles was promoted vigorously. In addition, this type of indwelling needles was also equipped with tip protection device. When withdrawing needle core after the puncture is successful, the needle core will be automatically put in the protective sleeve to avoid the risk of blood-borne pollution and acupuncture injury and reduce the occurrence of sharp injury among clinical operating personnel to the greatest extent. At the same time, the staff in operating room and instruments cleaning staff should perform personal standard prevention and wear special shoes of preventing acupuncture during work, so as to prevent the acupuncture caused by the fall of sharp instruments.

5.4 To standardize treatment of sharp instruments

After the occurrence of sharp injuries, it is necessary to take feasible and practical treatment in a timely manner and establish a complete reporting system and tracking system. All these are vitally important to control of occupational exposure. In case of sharp injury, it is necessary to immediately squeeze out the blood in the wound, wash the wound with flowing water or saline solution for ten minutes and then use iodine disinfectant for local wound disinfection. If necessary, the wound should be dressed. China is an area with high incidence of hepatitis B which has a surface antigen positive rate of 10.4%, and a hepatitis C virus anti-HCV adjusted prevalence rate of 0.43%. Besides, HIV infection is fast growing. According to an investigation among drug users in Chinese mainland, there was a total HIV infection rate of 3.3%, a total HBV infection rate of 25.0% and HCV infection rate of 50.4%^[10-12].

According to the literature, the infection rates of HIV, HBV and HCV caused by the sharp instruments polluted by the patients with blood transmitted diseases were 0.3%, 6.0%-30.0% and 0.4%-6.0%^[13-15], respectively. Therefore, medical staff should strengthen the implementation of protective measures in relevant links to prevent sharp injuries. Especially, it is necessary to strengthen the protection of patients whose top four examination indexes were positive before operation. In this study, 14.4% of the sharp injuries fail to identify or track blood-borne pathogen, which brings certain difficulty for the medication after occupational exposure. Therefore, effective preventive medication after occurrence of sharp injury remains to be further explored.

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Competing Financial Interests

The authors declare no competing financial interests.

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