Keywords: Brain injury, sensory stimulation, ICU.

Abstract: Background: Sensory stimulation (Auditory, visual and affective) is one of nursing intervention to enhance the level of consciousness among comatose patient caused by brain injury in Intensive Care Unit (ICU). However, little is known about the effect of sensory stimulation on brain injury patients. This study aims to examine the effectiveness of sensory stimulation in level of consciousness among brain injury patients in ICU. Method: source of the articles used are obtained from Scopus, Sage, PubMed, and Google scholar databases from year 2007 up to 2017. Fifteen articles was measured by using PICOT and SORT methods. Results: Sensory stimulation can be applied twice a day among brain injury patients to enhance the level of consciousness. Given sensory stimulation, the consciousness level of all patients was increase by measuring the Glasgow Coma Scale (GCS). Conclusion: Sensory stimulation (Auditory, visual and affective) is known to be more effective on enhancing level of consciousness when combined.

1 BACKGROUND

Head trauma is the most common cause of disability, death and hospitalization in intensive care units (ICU) throughout the world (Aghakhani et al., 2013). Patients with head trauma usually have different types levels of consciousness and cognitive function (Borlongan et al., 2015). In addition, patients with head injury usually takes a long time for the recovery process. If the patient does not get up from the coma will be complications like cognitive impairment, contractures, speech disorders, and brain death (Moattari, Shirazi, Sharifi, and Zareh, 2016).

In the United States, about 1.5 million people had head trauma, and 52,000 died from head trauma. From 1.5 million people who suffered head trauma, 90,000 people suffered severe head injuries that cause disability in a long time (Ferdon, Dahlberg, and Kegler, 2013). Although the incidence of mild and moderate head injuries decreased, the incidence of severe head injuries does not decrease. Patients with head trauma have neurological problems such as coma so that one of the main rehabilitation objectives is to awaken from the coma (Park, 2016).

A wide variety of rehabilitation techniques can be used for clients on head trauma (Abbate, Trimarchi, Basile, Mazzucchi, and Devalle, 2014). Sensory stimulation technique is non-invasive, low risk, inexpensive, and easy to apply for comatose patients after head trauma. The more sensors stimulation, the patient may show changes in the level of consciousness and awareness faster recovery (Kalani, Pourkermanian, & Alimohammadi, nd; Park, 2016).

Sensory stimulation techniques included in rehabilitation techniques (Abbate et al., 2014). Several studies have described that this technique effectively used for head trauma patients in intensive care units (Moattari et al., 2016). Research related to sensory stimulation in patients with head trauma known to have a good relationship between the stimulation of the healing process of patients with head injury (Johnstone, Yoon, Rupright, & Reid-Arndt, 2009).
Interventions using this sensory stimulation provide stimulus to the body. This intervention is usually divided into Kinesthetic, Auditory, Tactile, and Visual, thus providing multiple functions simultaneously. Auditory and visual stimulation is known to activate the limbic system which will be interpreted in the cerebral cortex to increase awareness. So, hopefully with lots of stimulus will be more efforts to activate the limbic system (Salmani, Mohammadi, Rezvani, & Kazemnezhad, 2017).

The explanation above describes the importance of stimulation to increase client awareness with head trauma in ICU. Thus, it is important to know the effects of sensory stimulation on head trauma.

2 METHODS

The methods used in the preparation of systematic review begins with the selection of the topic, keywords to search articles using the database Scopus, sage, pumbed, and googlescholar which was published in 2007 to 2017 with a combination of keywords brain injury, injury, sensory, ICU, and stimulation. All articles identified selected in accordance with research questions. Question of research on systematic review this is how evidence based (study of facts) about the effectiveness of sensory stimulation in patients with head injury consciousness in the ICU? How much time is needed to raise awareness of the patient? Inclusion criteria for this study is the use of the English language and the sample population was patients with head injury with loss of consciousness. From all articles that match the theme and the inclusion criteria then analyze again with Picot and methods scoring with SORT article.

3 RESULTS

The initial search found 32 articles. Read the article back if in accordance with the inclusion criteria. Found 17 articles that match and 25 articles into the exclusion criteria. 17 articles then go back and do a review in accordance criteria inclusion. So determined appropriate article 15 (Figure 1). 15 study that aims to explain the effectiveness of sensory stimulation to the head trauma was found (Johnstone et al., 2009; Kalani et al., Nd; Moattari et al., 2016; Park, 2016; Salmani et al., 2017). 5 The study focuses on the sensory stimulus auditory parts, one focusing on visual studies, and 9 other research is a combination of multimodal sensory stimulus that is affective. All articles are at level 1, 2, and 3 (Appendix 1).

3.1 Auditory Sensory stimulation

The auditory sensory stimulation can increase the awareness of patients with head injury (Kalani et al., Nd; Moattari et al., 2016; Park, 2016; Salmani et al., 2017).

Patients were more significantly enhanced awareness when listening to recordings of voice or family or people they care compared to listening to the voice of a nurse or a stranger. Sensory stimulation to the auditory part also increased more significantly when in stimulus directly, rather than indirectly. Examples stimulus Direct is a sound family visit and examples of indirect stimulus is sound TV.
3.2 Visual Sensory Stimulation

The visual sensory stimulation can also increase awareness. Visual sensory stimulation can be done using a virtual reality (VR). Virtual reality will show both 2-dimensional images and three-dimensional. Patients can be given a stimulus with photos or video without the sound of people loved. In addition, also using natural pictures such as forest or mountain can be given. However, the visual sensory stimulation is more effective when combined with auditory stimulation.

3.3 Affective Sensory stimulation of

Affective stimulation means the sensory stimulus is given by people known to the patient. This stimulation include multimodal stimulation on the auditory, visual, and kinesthetic conducted by relatives of known patients. Stimulus is known to raise awareness of head trauma patients in ICU. Increased awareness of unknown began to occur on the seventh day.

3.4 Total Time Giving Stimulus

Stimulus length of time given by the researchers to raise awareness of head trauma patients have a different number of days, starting from 5 days, 7 days, 14 days, 4 weeks, and 6 weeks. The number of days that is commonly used is 14 days. Despite all the number of days to raise awareness of head trauma patients, the number of days which is effective for patients experienced a significant increase in awareness is not yet known. Providing a stimulus to do almost all researchers 2 times a day at the same hour. Unknown stimulus effectively done for 15-30 minutes each meeting. Increased awareness of head trauma patients who do sensory stimulus in the ICU with measurement GlaslowComa Scale (GCS) on average increased after day 7 to 14 days the amount of stimulation (Moattari et al., 2016).

4 DISCUSSION

Providing stimulation is a challenge to nurses who provide care in the intensive care unit with a brain injury patients. One of the serious problems in patients with head injury is a coma on sensory deprivation (Moattari et al., 2016). This can cause an impact on the mental and perceptual problems and life-threatening conditions. Provide necessary stimulation given to the client even though the conditions of loss of consciousness or coma (Johnstone et al., 2009).

The first objective of this study was to compare the effectiveness of sensory stimulation auditory, visual and affective. Auditory sensory stimulation may alter cognitive function by increasing ventricular fluid drainage without negative impact to the physical such as increased ICP or cerebral perfusion pressure (Pape et al., 2015; Park, 2016). The other explanation may be the stimulus auditory provided directly have a level high interpersonal and content of the voice has an important meaning for the patient so as to activate the central motoric system with this stimulation (Ali & Gorji, 2014; Sullivan et al., 2017; Tavangar, Kalantary, Salimi, & Jarahzadeh, 2015).

Visual sensory stimulation increased awareness by providing stimulating effects that facilitate the dendrites to grow and connect with synaps. Another possible explanation is the incorporation of auditory and visual stimuli provide a soothing effect for patients. So the recovery process can be maximum (Gerber et al., 2017). It is also said that the possibility of combining some of the stimulus is more effective than a single stimulus. This is supported by studies on affective sensory stimulus.

Affective sensory stimuli that are provided by the family or nurse may be activate the limbic system. After that, it will increase sympathetic activity and increase norepinephrine at the nerve terminal. It is then interpreted by the cerebral cortex and ultimately raise awareness and spirit. Additionally, when families communicate, in which there is an element of visual stimulation, auditory and kinetic. In terms of auditory family may give positive expectations, or create positive memories. This is consistent with the model psiconeuroimunologcal that positive thinking would be associated with better health status. Moreover, it may also be due to each person will lean on spiritual beliefs to help them reduce stress. So the patient remain optimistic and reduced stress (Johnstone et al., 2009; Salmani et al., 2017; Schmidt-Wilcke et al., 2017).

Three explanations above show that more stimulus is given to patients with head injury who experienced loss of consciousness, will give a lot of response from the body. However, when compared one by one between the effects of audio, visual, and tactile, as well as affective until today still can not explain exactly which one is more effective when using only one stimulus compared to using a lot of stimulus. Thus, the need for further research related
to the effects of stimulus audio, visual, and tactile carried out by the use of the proper protocol by nurses.

The second research objective was to answer the time required for the stimulation of consciousness. Recovery in patients ranging from days 7 to 14 at the client with the most common used GCS is 8. To date, there is no clarity researchers examined the number of days studied and how many days are most effective used. Stimulus performed usually twice by investigators. Stimulus is done in a short time and repeats more effective than done in the long term. This is supported by research that the stimulus Meghan five times within 15 minutes is more effective than 1 time in 1 hour (Megha, Harpreet, and Nayeem, 2013). So, there is still need for further research how many days are effective to provide a stimulus to an increase in awareness significantly.

4.1 Implications For Nursing Practice

Providing caring is the main task of a nurse (Abdullah, Idris, and Saparon, 2017). This role must be adhered to by nurses, including nurse in the ICU who have the challenge to stimulate the client's level of consciousness as in the case of head trauma. Until more research is growing about the effectiveness of each of these stimuli, clinicians should use clinical recommendation today that have been proven, such as providing stimulus sensory in patients using stimulus auditory in directly that have been proven to raise awareness, or using a combination of auditory and visual, as well as involve the family as affective stimuli. Nurses and family can provide this stimulus of about 15 minutes at a stimulus and performed several times in one day. Given stimulus can improve patient recovery phase. Although, research related to the effectiveness of each stimulus is limited.

5 CONCLUSION

Sensory stimulation to the auditory, visual, and affective known to be effective is used in patients with head injury with GCS at least 5 in the ICU. The combination of multiple sensory stimuli such as auditory and visual known to be effective to increase awareness. However, there is a shortage of evidence based research on the effectiveness of each stimulus on head trauma in ICU. Clients are given a head trauma stimulation will begin to make a change after day 7. Intervention given a short time but often more effective than one but in a long time. However, up to now unknown number of days it takes to make it work significantly stimulation. Thus, it is advisable to more researchers studied the effects of long-term and short-sensory stimulation and to compare each stimulus. So that stimulation can know the effectiveness of sensory stimulus auditory, visual and kinetic.

REFERENCES


