

Is Turning Every 1 Hour More Effective than Turning Every 2 Hours to Prevent Pressure Ulcer Development?

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Abstract: Pressure ulcers (PU) are common on stroke patients with immobility. The best turning interval to prevent PUs development still unknown. The objective of this study was to compare the PUs incidence between stroke patients turned every 1 h and those turned every 2 h. This study used quasi experiment - post test with control group design, conducted between January – March 2018. Samples recruited within 1-3 days of admission in neurological ward in two hospital. The experimental group (n=26) was turned every 1 hour while the control group (n = 23) was done every 2 hours in the day (6 am – 6 pm) and every 3 hours in the night (6 pm – 6 am); using 30° tilt; continued for the next 5 days. All partisipants (n = 49) were 23 men and 26 women, aging 42-81 y/o. 6/26 patients (23.1%) in the experimental group and 6/23 patients (26.1%) in the control group developed PUs (p = 1.000; p > 0.05). All PUs were grade 1 (10.2%), grade 2 (12.2%), and DTI (2%). There was no statistically difference in PUs development over 5 days of turning between stroke patients those turned at 1 h or 2 h intervals.

1 BACKGROUND

Pressure ulcer incidence is found in stroke patients with immobility (Amir et al., 2013). Pressure ulcer is a localized injury in the skin and or the tissues underneath covering the bone resulting from pressure or the combination of pressure and shear or friction (Wiens, 2010; Casey, 2013). Pressure ulcer caused longer hospitalisation and extra nursing care (Dealey, et al., 2012), also decreased patient's health – related quality of life (Thein et al., 2010).

Approximately, more than 2.5 milion patients hospitalized develop pressure ulcer and 60,000 patients die of the complication of pressure ulcer (HRET, 2017). Mortality rate due to pressure ulcer count for 40% annually while patients die after one year treated with pressure ulcer in hospital count for 60% (Compas 2010 in Tarihoran, et al., 2010). The highest incidence of mortality resulting from pressure ulcer occurs in patients aging ≥ 75 years old and septicemia contribute to 39.7% mortality (Bryant, 2012). Post stroke complication and mortality increased in patients with pressure ulcer (Lee et al., 2016).

In Indonesian public hospital, hospital acquired pressure ulcer reaches 33% in 2007 (Amir, et al.,

2013). The incidence of pressure ulcer of patients with stroke in ICU & neurological ward in one of the government hospital in 2011 counted for 10/36 (28%) grade I and 6/36 (17%) grade 2 or higher. More than 50% of those including patients and families have been educated while 74% patients have been repositioned in irregular basis by either nurses or families (Amir, et al., 2013). Preliminary study conducted in Stroke Ward of Dr. Ramelan Military Hospital of Surabaya from April as of September 2017 found 79 patients developing pressure ulcer, 56 of whom are patients with stroke (19 prehospital acquired and 37 hospital acquired).

Pressure ulcer may occur 3 days after skin is exposed to pressure (Tarihoran, et al., 2010). Several factor affecting the development of pressure ulcer include tissue tolerance and pressure (duration and intensity) (Nursalam, 2016). Factor of pressure is influenced by decreased mobility, activity, and sensory perception commoly occurring in patients with stroke (Bryant, 2012).

Turning every 2 hours is one of the recommended nursing interventions to prevent the development of pressure ulcer (Linton, 2012; Miles, et al., 2014; HRET, 2017) resulting from decreased mobility and sensory perception in patients with

stroke. However a number of study found that turning every 2 hours is no longer efficacious to prevent the development of pressure ulcer (Ostadabbas et al., 2011; Bergstrom et al., 2013; Manzano et al., 2014).

Tarihoran, et al. (2010) did turning on patient with stroke using 30° triangle pillow for 2 hours interval toward the strong side, 2 hours supination, and 1 hour toward the weak side, but there was one patient developing pressure ulcer at sacrum. Study conducted by Ostadabbas et al. (2011) found that patients on supine position must be turned within less than 1 hour. In early 20 century, several books recommended more frequent turning despite limited research (Casey, 2013). Reddish body part and or weak/paralised body part must not be in the same position for > 30 minutes (Linton, 2012). Demol et al. (2013) found that the size and severity of deep tissue injury (DTI) can be reduced by shortened the repositioning interval. Therefore researcher tries to shorten turning interval for every 1 hour, 30° lateral turning position with one pillow and 30° head elevation in supine position. Shorter turning interval can reduce duration pressure, 30° lateral position can reduce pressure intensity while 15-30° head elevation during supination prevent shear and pressure against sacrum. This study aims to analyse the difference of pressure ulcer incidence on patient with stroke who were turned every 1 hour and 2 hours.

2 METHODS

2.1 Design

This study used quasy experiment - post test with control group design. This study hypothesis that there is different incident of pressure ulcer on patients who were turned every 1 hour opposed to 2 hours.

2.2 Sample

Samples of this study were stroke patients treated in Neurological Ward of Dr. Ramelan Military Hospital of Surabaya and Flamboyan Ward of General Hospital of Jombang for three months (1 January 1, 2018 – March, 31 2018) meeting inclusion criteria. Sample size was 54 patients; intervention group (n = 27) and control group (n = 27).

2.3 Inclusion and Exclusion Criteria

The main inclusion criteria of this study were stroke patient adults who were; suffering from immobility, Braden scale ≤ 18 , absence of pressure ulcer, absence of anasarca edema, stable hemodynamic (systolic blood pressure ≥ 100 mmHg), recruited within 1 – 3 days of admission in neurological ward. Exclusion criteria were; restless, having diagnosed or suspected spinal/ cervical injury/ brain death, on critical condition, and presence of pressure ulcer at admission/ before intervension started. Patients were dropped out if passing away/discharge/moving to other ward, patient's condition suddently deteriorated/ hypotension, and refused to continue the procedure before intervention was complete (5 days).

2.4 Procedures

Two sample groups were turned by researcher helped by an assistant. Control group was turned by using 30° tilt (right side, back, left side, back) supported by a pillow on the back every 1 hour in the day (6 am – 6 pm) and every 3 hours (supination and turned to the strong side) at night (6 pm – 6 am). Control group was turned 30° tilt (right side, back, left side, back) supported by a pillow on the back every 2 hours in the day (6 am – 6 pm) and every 3 hours (supination and turned to the strong side) at night (6pm – 6am).

Pressure ulcer risk assessment used Braden scale. Result of systematic review – meta analysis showed that Braden scale was more valid for general population with 87.42% sensitivity and 90% reliability (García-Fernández, et al., 2013). Similar studies found that should it be seen from >14 score, Braden scale would range from 82.4%-100% while specificity < 15, it wolud range from 72.7%-81.8%. By using cut of point 15, validity at Braden scale prediction would be sensitivity 88.2%, specificity 72.7%, FP 27.3% and FN 11.8%, and area beneath ROC curve was 0,880 (Kale et al., 2014).

Development of pressure ulcer was evaluated every time the position was changed until 5 x 24 hours using EPUAP-NPUAP 2014 pressure ulcer grade classification.

2.5 Analysis

Statistical tests utilized were; Chi-Square to figure out the difference of pressure ulcer incidence between stroke patients turned every 1 hour and 2 hours; Mann – Whitney to compare the difference of

PU grade classificatin between two groups. Statistical significance was set at the 5% level ($\alpha < 0.05$).

2.6 Ethical Considerations

This study has gained approval of ethical eligibility from ethic commission of health research Dr. Ramelan Military Hospital of Surabaya number 01/EC/KERS/2018. All informed consents were signed by the families.

3 RESULTS

Fifty nine patients selected for eligibility with consecutive sampling, 10 patients were dropped out due to; discharge (3), moving to the other ward (1), and passing away (6) before intervention was complete, leaving a final study sample of 49 patients, who were assigned to intervention group ($n = 26$) and control group ($n = 23$).

Participant distribution ranges from 42 to 81 years old with average age of intervention group (63.77 years old) and control group (67.26 years old); infarcted stroke (65.3%) and hemorrhagic stroke (34.7%); men (46.9%) and women (53.1%); braden scale > 9 (87.8%) and ≤ 9 (12.2%); albumin level $< 3\text{mg/dl}$ (6.1%) and $\geq 3\text{ mg/dl}$ (93.9%) (Table 1).

3.1 Incidence of Pressure Ulcers

Pressure ulcer occurred in both group i.e., 6 patients (intervention group), 6 patients (control group, and 37 patients no pressure ulcers development were found (Table 2).

The incidence of pressure ulcer in intervention group was 6/26 (23.1%) which included 2 patient developing grade 1 PU on sacrum and tight; and 4 patients developing grade 2 PU on buttocks. The incidence of pressure ulcer in control group was 6/23 (26.1%) which included 3 patients developing grade 1 PU on buttocks and trochanter; 2 patient developing grade 2 PU on buttock, tight, and shoulder; 1 patient developing deep tissue injury PU on the tight (Table 2 & 4).

Result of Chi - Square test shows no statistically difference of pressure ulcer incidence between intervention group and control group ($p = 1.000$ or $p > 0.05$) (Table 2). There was no statistically difference of pressure ulcer grade classification between stroke patients who were turned every 1 h and those turned every 2 h ($p > 0.05$) (Table 3).

This study found that 12/49 patients who developed pressure ulcer, 7/12 (58.3%) had it in the buttocks, 1/12 (8.3%) on sacrum, trochanter (2), tight (3) and left upper arm (1) (Table 4).

Table 1: Respondent distribution based on the age, types of stroke, age, albumin level, and Braden scale.

Characteristic	Intervention		Control		Total	
	n	%	N	%	n	%
Age						
≤ 75	20	76.9	19	82.6	39	79.6
> 75	6	23.1	4	17.4	10	20.4
Type of Stroke						
Infarction	10	38.5	7	30.4	17	34.7
Hemorrhagic	16	61.5	16	69.6	32	65.3
Gender						
Male	11	42.3	12	52.2	23	46.9
Female	15	57.7	11	47.8	26	53.1
Albumin						
< 3 mg/dL	3	11.5	0	0	3	6.1
≥ 3 mg/dL	23	88.5	23	100	46	93.9
Braden scale						
≤ 9	3	11.5	3	13.0	6	12.2
> 9	23	88.5	20	87	43	87.8

Table 2: Incidence of pressure ulcer in intervention and control group.

Pressure ulcer	Intervention		Control		Total	
	n	%	n	%	n	%
No PU	20	76.9	17	73.9	37	75.5
PU	6	23.1	6	26.1	12	24.5
Total	26	100	23	100	49	100

Chi-Square test, $p = 1.000$

Table 3: Grade of pressure ulcer in intervention and control group.

Grade of PU	Intervention		Control		Total	
	n	%	n	%	n	%
No PU	20	76.9	17	73.9	37	75.5
Grade 1 PU	2	7.7	3	13	5	10.2
Grade 2 PU	4	15.4	2	8.7	6	12.2
Deep tissue injury	-		1	4.3	1	2.0
Total	26	100	23	100	49	100

Mann-Whitney test, $p = 0.831$

Table 4: Location and time of incidence of pressure ulcer in intervention and control group.

No	Age (y/o)	Albumin (g/dL)	Grade	Location	Time (day)
Intervention group (turning every 1 hour)					
2	52	4.58	2	left and right buttocks	2
4	78	3.53	1	sacrum	5
9	62	4.38	2	left and right buttocks	4
20	71	4.42	1 & 2	left buttock (1) & right buttock (2)	2
22	43	3.82	2	right thigh	3
26	67	3.81	1	left buttock	3
Control group (turning every 2 hours)					
4	67	3.89	2	left thigh, left upper arm	2
7	58	3.85	1	left and right buttocks, left trochanter	4

4 DISCUSSION

4.1 Age & Gender

Five patients (41.7%) developed pressure ulcer were aged ≥ 71 years old; 3 patients (25%) were aged 60-70 years old; and 4 patients (33.3%) < 60 years old (Table 4). Previous study revealed that no significant association between age and development of pressure ulcer, but indicate risk. Patients aging ≥ 71 years old were 0.8 times greater to suffer from pressure ulcer (Tarihoran et al., 2010). Pressure ulcer was significantly increased poststroke mortality in patients aged 60 years or older (Lee et al., 2016). Pressure ulcer incidence in elderly can increase risk for mortality and reduce quality of life (Khor, et al., 2014).

According to the distribution of sex of PU development, 12 patients developed PU (6 women; 6 men). It show equal incidence of pressure ulcer both in men and women (50% : 50%). Pressure ulcer was correlated with poststroke mortality and complications in men and women (Lee et al., 2016). Haast et al. (2012) suggested that women are a higher risk for bad prognosis such as decreased quality of life and increased risk for post stroke depression compared to men.

4.2 Incidence of Pressure Ulcer

This study revealed no difference in pressure ulcer development between stroke patients turned every 1 hour and those turned every 2 hours. The study hypothesis was rejected. Previously, there was no study which turned patients every 1 hour.

The previous studies compared the turning interval every 2 hours with 3, 4, or 6 hours. A study conducted by Bergstrom et al. (2013) statistically revealed no difference in pressure ulcer incidence on patients who were turned every 2, 3 and 4 hours. A study conducted by Manzano et al. (2014) also found no difference in pressure ulcer incidence between patients who were turned every 2 hours and 4 hours. Result of systematic review cannot prove the best interval between 2 h vs 3 h, or 4 h vs 6 hours (Gillespie, et al., 2014).

Demol, et al. (2013) conducted a study by comparing 4 turning interval; every 2, 3, 4, and 6 hours over degree of DTI. The study revealed degree and extent at deep tissue injury could be reduced by shortening the turning interval.

Still et al. (2013) conducted an experiment at turning team who did the turning every 2 hours around the clock on patients with stable hemodynamic condition. The study found that turning every 2 hours by employing a turning team could reduced pressure ulcer incidence from 15.1% (before) to 5.24% (after).

No discrepancy of pressure ulcer incidence on both groups turned every 1 h and 2 h resulted from turning which was not carried out in 24 hours. In the day (6 am – 6 pm) turning was done every 1 h (intervention group) and 2 h (control group) while at night (6 pm – 6 am) turning was performed every 3 hours. Night turning was carried out every 3 hours aimed to minimize disturbing sleeping time because sleeping and rest is important for recovery process (Latimer et al., 2015). A study conducted by Moore et al. (2011) found that turning every 3 hours at night with 30° lateral tilt reduced pressure ulcer incidence by 67% than those turned every 6 hours with 90° lateral rotation (Moore & Cowman, 2012).

According to a study by Ostadabbas, et al. (2011) body can maximum tolerate supine position for 1 hour. Erythema can develop within 1-2 hours on person with healthy skin and adequate circulation (Linton, 2012). Ischemic stroke affecting motor cortex leads to weakness/ paralysis on the muscle innervated by the nerve; as a result, muscle contraction weakens or loses. If the paralysed or weak area is underneath and is under prolonged pressure, it will potentially lead to development of

pressure ulcer (Pendit, 2017). Therefore, paralysed area must not be at similar position for 30 minutes (Linton, 2012).

An experimental study found that ischemia for at least 90 minutes lead to organ and root fiber damage. Prolonged ischemia may reduce adenosine triphosphate (ATP) and compromise cellular activities leading to necrosis and subsequent pressure ulcer (Casey, 2013).

4.3 Location of Pressure Ulcer

This study found only 1 of 12 patients who developed pressure ulcer at sacrum. Reduced incidence of pressure ulcer on sacrum due to 30° lateral position allows distribution of pressure in wider areas (Nursalam, 2016), and can reduce pressure against sacrum (Miles et al., 2013). According to Yoshikawa, et.al. (2015) sacrum is in intense contact with the surface of the bed during supination. 30° and 40° lateral position can minimize contact with the surface of the bed.

This study also found that 7/12 (58.3%) patients developed pressure ulcer in the buttocks. Different from theory proposed by Bryant (2012) and Nursalam (2016) stating that the most frequently affected areas include sacrum (28.3%), heel (23.6%), dan buttocks (17.2%). Miles et al. (2013) found that the most affected area include sacrum, buttocks, and heel.

Previous studies show no significant association between body mass index (BMI) and pressure ulcer incidence, but indicate risk, for patients with BMI < 18 at risk for 0.8 time to develop pressure ulcer (Tarihoran et al., 2010). People with lower BMI lead to have extending bone more than those with higher BMI. However, the prevalence of pressure ulcer is higher in patients with lower BMI as well as in patients with low or obese weight (Kale et al., 2014).

The latest study found significant association between buttock shape and risk for pressure ulcer, round and square buttocks have significant influence over higher BMI and Waterlow Risk Assessment scores (Dunk & Gardner, 2016). Other factors likely to contribute to the development of pressure ulcer in buttock area include buttock shape correlated with higher BMI, moisture, and duration of supine position (3 hours at night). Higher BMI than normal with round and square buttock shape leads to pressure against buttock during supination. In addition, buttock still touches the bed despite 30° lateral position (supported by 1 pillow on the back). All patients in this study used diapers. Using diapers

leads to more moisture area. HRET (2017) suggested not to use diapers when laying down on the bed to prevent pressure ulcer. Review conducted by Coleman, et al. (2013) found 3 most contributing factors in the development of pressure ulcer which include mobility/activity, perfusion, condition of skin/pressure ulcer. Skin moisture, age, nutrition, hematology are also the contributing factors, but are not as frequent as the three factors mentioned.

4.4 Limitations

This study has some limitation. Both groups were not turned with equal interval for 24 hours. At night turning was done every 3 hours at 6pm – 6am to prevent from disturbing the patients during sleep (ethical consideration). Therefore, the incidence of pressure ulcer was likely to occur due to length turning interval at night. Small number of sample is less strong for generalization. Patients using diapers can be bias in whether pressure ulcer was caused by pressure or moisture caused by diaper.

5 CONCLUSIONS

Turning every 1 hour is not better than 2 hours to prevent the development of pressure ulcer. In addition to turning, other factors deserve consideration such as turning duration at night, material of the mattress, moisture, body and room temperature as well as diaper utilization. Turning every 2 hours can still be done in clinical practice as long as no latest study suggesting the better turning interval. Further studies with more samples and equal turning interval for 24 hours are needed.

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