

## Case Report

# Management of trimalleolar fracture in Sanglah hospital: a case series

I Wayan Subawa\*, Hafidz Addatuang Ambong, Trimanto Wibowo, I Gede Mahardika Putra

Department of Orthopaedic and Traumatology, Sanglah General Hospital, Udayana University, Bali, Indonesia

**Received:** 24 October 2018

**Accepted:** 30 November 2018

**\*Correspondence:**

Dr. I Wayan Subawa,

E-mail: wayansubawa76@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

Trimalleolar fractures are one of the most complex fracture around ankle. This study aims to assess the functional outcome and result of the surgical treatment for trimalleolar fracture. Case 1: A 49-years-old male experience closed fracture left ankle Lauge-Hansen PER type IV caused by traffic accident. Patient present with swollen and painful around ankle with an inability to bear weight on the affected extremity. Case 2: A 36-years-old female sustained closed fracture at right trimalleolar ankle, closed fracture at right talus nondisplace Hawkins I, and closed fracture at second, third, and fourth metatarsal. Case 3: A 57-years-old female came with history the left ankle twisted after got slipped and fell down at the yard. Patient was diagnosed by closed fracture left ankle Lauge Hansen SER type IV. Ankle fracture mostly happen in young men and older women during sporting activities or even bicycle or car accidents. The Lauge-Hansen system classify the fracture based on the position and the direction of the ankle when trauma happen. The AOFAS was use for evaluation patient-relevant outcomes in patients operated on with anatomical ankle injury. In or present study of 3 patients with ankle fractures that were unstable, displaced or both treated surgically by open reduction with internal fixation in accordance with Lauge-Hansen classification. The result in our series confirm that all of 3 patients have a good result based on AOFAS scoring for evaluation the treatment and it means the management approve the good functional outcomes for the patients with ankle fractures.

**Keywords:** Management, Sanglah hospital, Trimalleolar fracture

### INTRODUCTION

Ankle fractures are commonly seen at emergency department accounting for approximately 10% of all fractures.<sup>1,2</sup> From that much, approximately 20% of ankle fractures that require internal fixation.<sup>2</sup> Ankle fracture mostly affect young men and older women.<sup>3</sup> For patients under 50 years old, the ankle fractures commonest happen in men population.<sup>3</sup> Ankle fracture that have syndesmosis commonly happen caused by pronation-external rotation, pronation-abduction, and less frequently supination external rotation mechanism.<sup>2</sup> It occur after inversion or eversion twisting trauma like traffic accident and sports injuries.<sup>4</sup> Initial fracture of the

medial malleolus consequently occurs when the main cause is high-energy trauma.

The common classification system that used for ankle fractures are The Danis Weber classification and The Lauge-Hansen classification.<sup>2</sup> Lauge-Hansen proposed a classification system that correlates the line of ankle fractures with certain trauma mechanism. The fractures are classified into four groups: supination-abduction, supination-eversion, pronation-eversion, and pronation-abduction.<sup>5</sup> The first term is indicating the position of the foot when the injury and the second refers to the direction of the force applied to the foot at the time of trauma. The supine-eversion pattern is the most common as much as 40% to 75%.<sup>6</sup>

Danis and Weber classification based on the localization of the main fibular fracture line. This classification divided fractures into the three groups: type A (below the syndesmosis level), type B (at the syndesmosis level), type C (above the syndesmosis). This classification disregards the state of the structures on the medial side, a vital osteoligament structure, and it is not possible to compare prognosis, treatment, or evolution of the pathology with this classification alone.<sup>6</sup>

The diagnosis of the ankle fracture is determined using a combination of the patient's history, physical examination, and radiographic evaluation. Patients with an ankle fracture will present acute deformities, swelling (especially perimalleolar), bony tenderness, discoloration, ecchymosis, open wounds, the overall soft tissue condition and neurovascular status of the injured limb.<sup>7</sup> In addition, the patients that have no history of trauma, must check for pathological condition that may related with neurological disorder, such as dry, scalding skin, claw toes, subtle clavus, and loss of protective sensation in the four plantar sites. From the physical examination will found early lateral, proximal, and mid shoe wear indicates a supination deformity, wear on the medial border indicates a pronation deformity.<sup>8</sup> Most time, pain make the physical examination difficult. Radiographs typically reveal trimalleolar fracture. In the case of fracture-discoloration, CT scanning can be used for planning the operative approach.<sup>7</sup>

The goal treatment of ankle fracture is reduce the fracture into the stable anatomic of talus in the ankle mortise and correction of the fibula length.<sup>2</sup> However all studies have not obtained good result in cases of trimalleolar fractures.<sup>2</sup> For the general management, stable fractures are treated with cast immobilisation, whereas unstable fractures are treated by internal fixation.<sup>1</sup> As all intrarticular fracture, trimalleolar fractures mainly need reduction and stable internal fixation.<sup>4</sup> Lateral malleolus, done by lateral incision and used length of fibula for maintained and best fixed with a one third semitubular plate placed over the lateral surface of the fibula and bent after that done twisted. Medial malleolus was fixed by screwing and wiring. Posterior malleolus was fixed with one or two 4mm cancellous screws with a small stab incision in a anteroposterior or posteroanterior direction and is done percutaneously.<sup>2</sup> The prior studies show a possible advantage of early weight bearing make the results in faster recovery and better ankle function.<sup>4</sup>

According to this study, there is three patients with trimalleolar fractures who attended Sanglah General Hospital included in this study. All of three patients have a complete examination and done the treatment. Post-operative, assessment was done at 3 weeks, 6 weeks, and 13 weeks according to the American Orthopaedic Foot and Ankle Society (AOFAS).<sup>1</sup> AOFAS is a clinical instrument for assessing outcome after ankle and hindfoot injuries that combines subjective score of pain and function provided by the patient with objective scores

based on the surgeon's physical examination of the patient (to assess sagittal motion, hindfoot motion, ankle-hindfoot stability and alignment of ankle-hindfoot).

The AOFAS scale includes nine items that can be divided into three subscales (pain, function, and alignment). Pain consists of one item with a maximal score of 40 points, indicating no pain. Function consists of seven items with a maximal score of 50 points, indicating full function. Alignment consists of one item with a maximal score of 10 points, indicating good alignment. The maximal score is 100 points, indicating no symptoms or impairments.

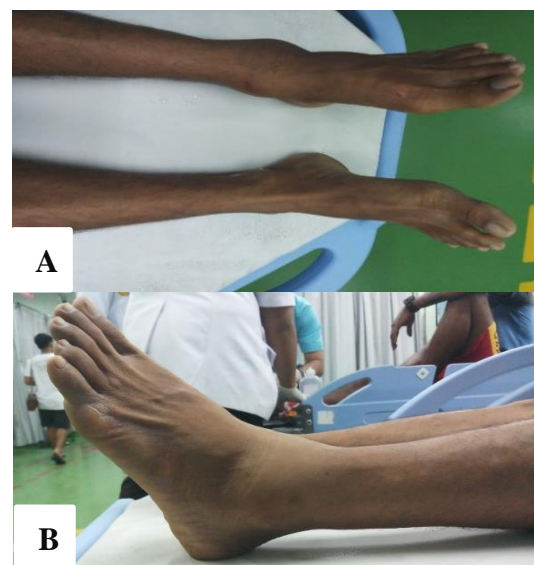
The aims of this study are to assess the functional outcome and result of surgical treatment of trimalleolar fractures by specific modalities of plating of lateral malleolus, screwing and wiring of medial malleolus, and screwing of posterior malleolus.

## CASE SERIES

### Case 1

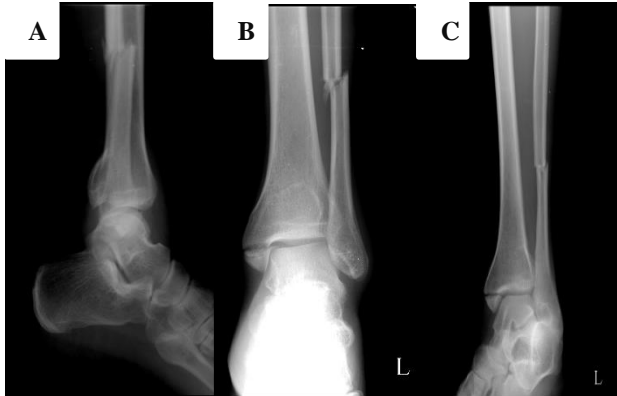
Male, 49 year, came to the hospital with chief complain of pain over the left ankle after fell down 30 minutes prior to admission. Patient came conscious after suddenly slipped when riding motorcycle and fell to the left side with the left ankle twisted outward resist his motorcycle. There was no history he got traffic accident or trauma around ankle before.

On the inspection, from the left ankle region look swelling with no deformity. On palpation there was a tenderness over the lateral and medial malleolus. Artery dorsalis pedis was still palpable with capillary refill time under 2 second. He denied a history of systemic disease. There is no history the same condition and genetic bone disease in his family.



**Figure 1: Clinical picture of the patient: (A) AP view (B) lateral view.**

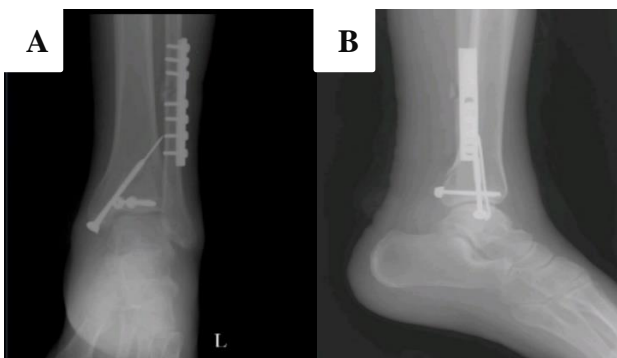
From clinical findings and plain x-ray (Figure 1 and Figure 2), he was assessed with Closed Fracture left ankle Lauge-Hansen Per type IV. Patient was treated by open reduction with internal fixation-percutaneous surgery (ORIF-PS) and screwing. Post-op X-rays showed proper position of the screws (Figure 3, Figure 4 and Figure 5).



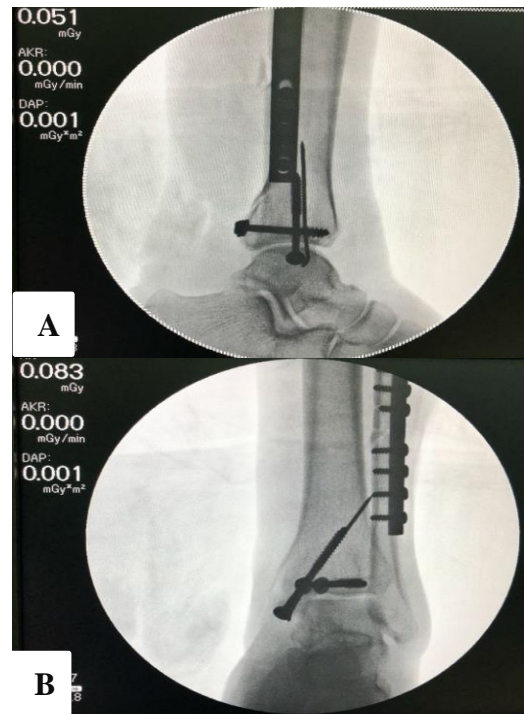
**Figure 2: Left ankle x-ray: (A) AP view (B) Lateral view (C) mortis view.**



**Figure 3: Post-operative clinical picture: (A) AP view (B) lateral view.**



**Figure 4: Post operative left ankle x-ray: (A) AP view (B) lateral view.**



**Figure 5: Left knee C arm durante Op.**

**Case 2**



**Figure 6: Clinical picture of right ankle region: (A) AP view (B) lateral view.**

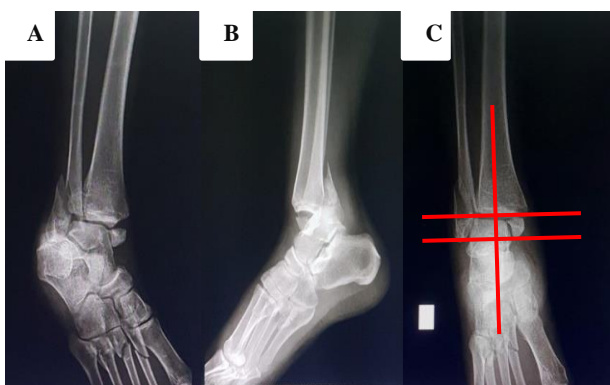
A 36 year female, came to the hospital complained pain on her right ankle after had a traffici accident. Patient was



riding a motorcycle, suddenly lost the balance and fell down to the right side and the motorcycle hit the right ankle.



**Figure 7: Clinical picture of right foot region. (A) AP View (B) lateral view.**

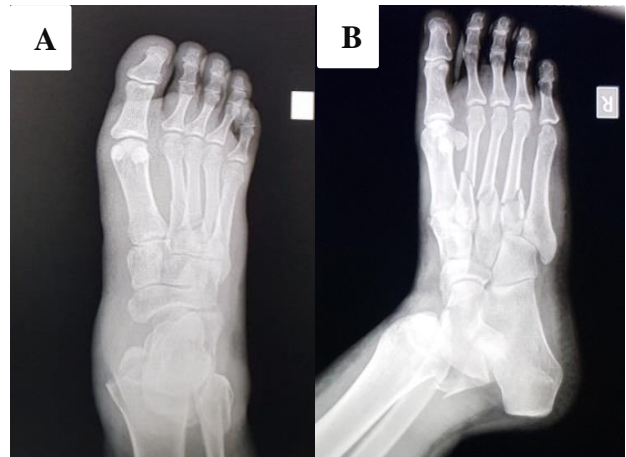


**Figure 8: Right ankle x-ray. (A) AP view (B) lateral view (C) mortise view.**

On the physical examination at right ankle region, there was excoriatum with size 3x2cm at dorsal side of ankle. At the same region, there was swelling around ankle and dorsal side of metatarsal with no deformity. From the palpation, there was tenderness around ankle and both

lateral and medial side of malleolus with crepitation at leg distal third and medial side of ankle when removed spint. Artery dorsalis pedis was still palpable.

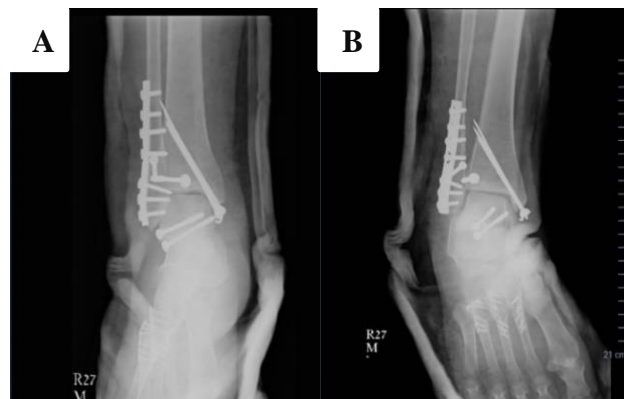
Examination at right foot region, the doctors founded swelling around dorsal part of metatarsal region with multiple excoriation. From the palpation, there was tenderness at metatarsal region and artery dorsalis pedis was still palpable at that time. There was no abnormal sensation.



**Figure 9: Right pedis x-ray. (A) AP view (B) oblique view.**



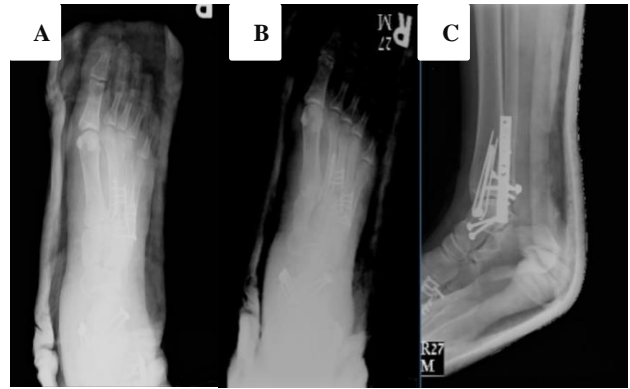
**Figure 10: Clinical picture post Op.**



**Figure 11: Post operative right ankle x-ray. (A) AP view (B) lateral view.**

From the physical examination and plain x-ray, she was diagnosed with closed fracture right trimalleolar ankle, closed fracture right talus nondisplaced Hawkins I, and closed fracture right 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> metatarsal (Figure 6, Figure 7, Figure 8 and Figure 9).

Patient was treated by open reduction with internal fixation (ORIF) pinning for talus and metatarsal fracture, open reduction with internal fixation (ORIF) screwing and pinning for medial and posterior malleolus, and open reduction with internal fixation-percutaneous surgery (ORIF-PS) for lateral malleolus. Post operative X-rays showed proper position of the pin and screws (Figure 10, Figure 11 and Figure 12).



**Figure 12: Post operative right pedis x-ray. (A) AP view (B) oblique view (C) mortise view.**



**Figure 13: Clinical picture of the patient. (A) lateral view (B) AP view.**



**Figure 14: Left ankle x-ray. (A) AP view (B) lateral view.**

**Case 3**

Female, 57 year, came complained pain over her left ankle after fell down 3 hours before admission. Patient was walking at the yard and suddenly slipped and fell down with her left ankle twisted. No history of unconsciousness, nausea, and vomiting.



**Figure 15: Post operative clinical picture. (A) AP view (B) lateral view.**



**Figure 16: Post operative left ankle x-ray. (A) AP view (B) lateral view.**

From the inspection, there was swelling around the ankle, bruise, and external rotation. On the palpation, there was tenderness over the ankle with artery dorsalis pedis was still palpable.

Based on the physical and radiologic examination, he was assessed with closed fracture left ankle Lauge Hansen SER type IV (Figure 13 and Figure 14). The patient was treated by open reduction with internal fixation-percutaneous surgery (ORIF-PS) and open reduction with internal fixation screwing. Radiology examination showed the proper position of the screw (Figure 15 and Figure 16).

## DISCUSSION

Number of events of ankle fractures approximately 10% of all fractures with 20% of that case require an internal fixation.<sup>1,2,9</sup> Ankle fracture are common that occur mainly in young men and older women during sporting activities or even bicycle or car accidents.<sup>4</sup> As mentioned earlier, the general management for unstable fractures like ankle fractures are open reduction with internal fixation. It completely done using plate for lateral malleolus, screw and wires for medial malleolus, and screw for posterior malleolus.<sup>2</sup> Open surgical techniques have several disadvantages and complications.

The management for lateral, medial, and posterior malleolus fracture based on the literature is doing by plating, tension band wiring, and percutaneous screw fixation.<sup>10</sup> The American Orthopaedics Foot and Ankle Society (AOFAS) was use for evaluation patient-relevant outcomes in patients operated on with anatomical ankle injury.<sup>11,12</sup> From the literature, the used of this treatment method give the good result on fracture union and on the functional outcome that were analyzed by AOFAS and the Biard and Jackson system at the end of 10 weeks.<sup>13</sup> A two-year follow-up study on the functional outcomes and quality of life of patients with type B ankle fracture showed that nearly 60% of the patients had good clinical outcomes, with patients' sensation of full recovery only 37%, 40% hard work-related problems and 60%

complained of ankle related with leisure or sports activities.<sup>14</sup> But, the newest study found that quality of life was negatively affected in patients with ankle fractures two year after the injury.

Several complications that may occur including soft-tissue damage during the operative procedures, higher post operative pain that causing delay in physical therapy and make a longer hospital stay. Sometimes it may include blister that will happen. The other complications reported include insufficiency primary osteosynthesis, infection, osteoitis, DVT, delayed union, nonunion, secondary displacement, refracture, stiffnes, muscular atrophy, tendinous insufficiency, sensory defisit, tarsal tunnel syndrome, and complex regional pain syndrome type I.<sup>10,11</sup> But, increased knowledge about the normal and post traumatic anatomy and function of the ankle joint has led to demands prompt operative treatment of the trimalleolar fractures that will improves functional outcome.<sup>2</sup>

Based on the previous study, the used of AOFAS scoring system have no significant differences in functional outcomes between fracture severity classification. But this study not included trimalleolar fracture. That result showed the functional outcomes for patient with unimalleolar and bimalleolar fractures.<sup>14</sup> But this study predicted that patients with trimalleolar fracture will have a long-term effect and a long-term rehabilitation period if compared with patients who get the unimalleolar or bimalleolar fractures.<sup>14</sup>

The Lauge-Hansen method is useful as an initial assessment tool and as a guide treatment for the cases on this study. The use of the Lauge-Hansen system was found give a good result caused by the classification of that based on the position and the direction of the ankle when trauma happen. This study supports the scoring result by American Orthopaedic Foot and Ankle Society for this series. The result proves about all of the patients in this series achieved good results and also had anatomical reduction of all the malleolus as well as anatomical reduction of talus radiologically. It is seen that the internal fixation of lateral, medial, and posterior malleolus reduces the chances of skin necrosis as compared to the single postero-lateral incision for posterior as well as lateral and medial malleolus.

This percutaneous fixation reduces soft tissue trauma and posterolateral complex of vessels is less hampered which resulted in reduced AVN of talus as a late complication.<sup>2</sup> In this study it was seen that better biomechanical stability of ankle was also related to fixation of diastasis only after fixation of lateral, medial, and posterior malleolus. After fixation the medial and lateral malleolar, the stability was checked under C-arm with the help of lateral and medial stress tests. This kind test checking of congruency of talus with both malleolus by C-arm produces the maximum contact weight bearing surface of ankle joint.<sup>2,14</sup> The chances of non-union in medial



malleolus were reduced by observe the periosteal interposition during the fixation process.

Postoperatively at the end of 3, 6, and 13 weeks, the author do follow up for this patient by using AOFAS scoring, an ankle evaluation management. Based on the calculation, the points for the three patients are 89 points, 80 points, and 83 points. That score means all of the patients with done plating management for lateral malleolus fracture, screwing and wiring of medial malleolus fracture, and screwing for posterior malleolus fracture have the good result based on the AODAS scoring for evaluation treatment.

## CONCLUSION

In or present study of 3 patients with ankle fractures that were unstable, displaced or both treated surgically by open reduction with internal fixation (ORIF) in accordance with Lauge-Hansen classification. Understanding the mechanism of trauma is essential for good reduction and internal fixation. By doing plating, screwing, and wiring will increase anatomical reduction. The result in our series confirm that all of three patients get the good result based on AOFAS scoring for evaluation the treatment. That means the management approve the good functional outcomes for the patients with ankle fractures.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: Not required*

## REFERENCES

1. Verhage SM, Schipper IB, Hoogendoorn JM. Long-term functional and radiographic outcomes in 243 operated ankle fractures. *J Food Ankle Res.* 2015 Dec;8(1):45.
2. Sipahioglu S, Zehir S, Isikan E, Weber C. Ankle Fractures with tibiofibular diastasis: Syndesmosis-Only Fixation. *Acta Ortop Bras.* (online). 2017;25(3):67-70.
3. Srivastava DC, Yadav S, Singh A, Gupta A. The Functional Outcome of Fixation of Trimalleolar Fracture, through Fixation of Lateral Malleolus by Plating, Medial Malleolus by Tension Band Wiring and Percutaneous Screw Fixation of Posterior Malleolus: A Prospective Study. *J Bon Joi Dis.* 2016;31(2):30-32.
4. Briet JP, Houwert RM, Smeeing DP, Pawiroredjo JS, Kelder JC, Lansink KW, et al. Weight bearing or non-weight bearing after surgically fixed ankle fractures, the WOW! Study. study protocol for a randomized controlled trial. *Trials.* 2015 Dec;16(1):175.
5. Van Lieshout EM, De Boer AS, Meuffels DE, Den Hoed PT, Van der Vlies CH, Tuinebreijer WE, et al. American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Score: a study protocol for the translation and validation of the Dutch language version. *BMJ open.* 2017 Feb 1;7(2):e012884.
6. Fonseca LL, Nunes IG, Nogueira RR, Martins GE, Mesencio AC, Kobata SI. Reproducibility of the Lauge-Hansen, Danis-Weber, and AO classifications for ankle fractures. *Revista Brasileira de Ortopedia.* 2018 Feb;53(1):101-6.
7. Rammelt S. Management of Ankle Fracture in the Elderly. *EFORT Open Rev.* 2016;1:239-46.
8. Alazzawi S, Sukeik M, King D, Vamulapalli K. Foot and Ankle History and Clinical Examination. A Guide to Everyday Practice. *World J Orthopaed.* 2017;8(1):21-9.
9. Bükür N, Şavkın R, Gökalp O, Ök N. Validity and reliability of Turkish version of Olerud-Molander ankle score in patients with malleolar fracture. *The Journal of Foot and Ankle Surgery.* 2017 Nov 1;56(6):1209-12.
10. Mehta SS, Rees K, Kulter L, Mangwani J. Understanding Risks and Complications in the Management of Ankle Fractures. *Ind J Orthopa.* 2014;48:445-52.
11. Litrenta J, Saper D, Tornetta III P, Phieffer L, Jones CB, Mullis BH, et al. Does syndesmotomic injury have a negative effect on functional outcome? A multicenter prospective evaluation. *J Orthopa Tra.* 2015 Sep 1;29(9):410-3.
12. Roos EM, Brandsson S, Karlsson J. Validation of the foot and ankle outcome score for ankle ligament reconstruction. *Foot & Ankle International.* 2001 Oct;22(10):788-94.
13. Rao SS, Naidu MC, Rao VD, Kumar VA, Teja PS. Study of functional outcome of surgical management of unstable malleolar fractures in adults: a case report. *J Evo Med Dent Scienc.* 2015 Sep 24;4(77):13526-30.
14. Segal G, Elbaz A, Parsi A, Heller Z, Palmanovich E, Nyska M, et al. Clinical outcomes following ankle fracture: a cross-sectional observational study. *J Foot Ank Res.* 2014 Dec;7(1):50.

**Cite this article as:** Subawa IW, Ambong HA, Wibowo T, Putra IGM. Management of trimalleolar fracture in sanglah hospital: a case series. *Int J Res Med Sci* 2019;7:278-84.