# Outcome Of Pertrochanteric Fracture Following Intramedullary Fixation With PFN A

[1]**Dr D Raja Sujith Kumar,**[2] **Prof.Dr. Yeshwanth Subash.**
[1]Junior resident Department of Orthopedics Saveetha Medical College and Hospital Thandalam, Chennai-602105 Tamilnadu, India.
[2]Corresponding author: D.N.B(ORTHO), M.N.A.M.S Department of Orthopedics Saveetha Medical College and Hospital. Address: h-3,Harrington court 99,Harrington road chetpet Chennai-600031. Tamilnadu, India. djyesh@rediffmail.com

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***Abstract:***

***Introduction:****Pertrochanteric fractures, common among the elderly, present challenges in attaining a successful recovery to mobility. This research investigates the clinical outcomes and advantages of treating pertrochanteric fractures with intramedullary treatment utilizing the PFNA (Proximal Femoral Nail Antirotation) procedure.*

***Methods:*** *Prospective researchhas been conducted with 24 patients who had PFNA treatment for pertrochanteric fractures between April 2022 and April 2023.Boyd and Griffin's classification was used to group the patients. Surgical techniques, side effects, and recovery after surgery were all thoroughly documented. The Harris Hip Score has been employed for clinical assessment.*

***Results:****The patients' average age was 60.8 years, and women made up 75% of the population. Fractures were primarily a result of low-energy trauma, with 80% attributed to self-falls. PFNA surgery, with an average duration of 1 hour 29 min, demonstrated successful fracture union within 13 weeks. The six-month Harris Hip Score revealed outstanding outcomes in 20.8%, good in 66.6%, and fair in 12.5% of cases. Complications included abductor lurch, deep vein thrombosis (DVT), and superficial infections, all managed effectively.*

***Conclusion:****The PFNA technique proves effective in achieving successful outcomes for pertrochanteric fractures in elderly patients. Shorter operating times, minimal blood loss, and favorable clinical results, as indicated by the Harris Hip Score, underscore PFNA's suitability as a preferred implantation approach. This study advocates for the continued exploration of PFNA's benefits in treating pertrochanteric fractures, emphasizing its potential for enhanced stability and mobility restoration in the elderly population.*

***KEYWORDS-****Pertrochanteric,PFNA,Harris hip score*

## INTRODUCTION

Pertrochanteric fractures refer to fractures arising in the areathat runsfrom the extracapsular basilar neck to the lesser trochanter of the femur.These kinds of fractures are predominantly observed in the elderly age group and are often a consequence of trauma withlowenergy like accidental falls related to compromised bone quality as well asosteoporosis (1-3). However, it's noteworthy that high-velocity trauma in younger individuals can also lead to the same type of fracture(3). A strong vertical bone structure called the calcar femorale extends from the posteromedial side of the femur shaft to the posterior region of the femoral neck. Its significance lies in determining the stability of the fracture. The expansive metaphyseal region benefits from a rich blood supply, contributing to reducing the incidence of osteonecrosis and increasing the rate of union in comparison to femoral neck fractures. The main objective of surgical treatment is to promote early mobilization and restoration to the level of activity that existed before the fracture. The choice of the optimal implant for stabilizing FPF (Femoral Peritrochanteric Fractures)remains a subject of ongoing debate.ThePFN (Proximal Femoral Nail) has been specifically designed to enhance the proximal fracture fragment'srotational stability (4,5). By notably reducing bone stress, the nail tip redesign aimed to reduce the risk of intra- and postoperative femoral shaft fractures.The AO/ASIF group then created the PFNA in 2004 to further improve rotational as well as angular stability using a single element. This was achieved through a helical blade design, eliminating the need for an additional anti-rotation screw, a feature present in the conventional PFN(6). In comparison to regularly used screw systems, biomechanical testing demonstrated a significantly stronger resistance to cut-out in osteoporotic bone (6). This research aims to evaluate the benefits as well as clinical outcomes of PFNA.

## PATIENTS AND METHODS

This research, performed at the orthopedic department of Saveetha Medical College and Hospital in Thandalam between April 2022 and April 2023, involved 24 patients with trochanteric fractures. Our study included patients who had established pertrochanteric fractures as classified by Boyd and Griffin, were willing to receive treatment, and were available for follow-up. Patients who were hemodynamically unstable, skeletally immature, or unsuitable for surgery were excluded.Every patient had a thorough medical history taken, which was kept on file in the hospital. Every patient underwent a clinical evaluation. Preoperative medical assessments were conducted for all patients to mitigate potential complications posing risks to life or limb. The patient's overall well-being was evaluated, taking into account factors such as hypovolemia, associated orthopedic injuries, or systemic issues. Treatment prioritization was given to any concurrent systemic injuries. Surgery has beenperformed at the earliest possible time, contingent upon the patient's general medical condition. Intravenous administration of analgesics and antibiotics was universally administered. Adherence to a rigorous preoperative protocol involved pre-anesthetic checkups, obtaining required clearances, and patient preparation, including ensuring ample blood supply. A mandatory six-hour fasting period preceding surgery was implemented. Additional consents that were required including high-risk consent, were collected.

Under the supervision of C-arm fluoroscopy, every fracture was managed on the fracture table. By using closed reduction, the fractures were lessened. After the outcome was satisfactory, an incision has been made around 5cm in front of the greater trochanter's tip.The right angle and place of entrance were crucial for the outcome. At the tip or somewhat laterally of the greater trochanter, the guide wire should be positioned at an angle of 68 to the intended extension of the medullary bone.Sometimes the surgery was challenging due to a "floating" greater trochanter, or the reduction was only attainable by abducting the leg that was affected.The femur has been delicately opened througha hand or quickly opened with a power instrument. Severe compression forces or Lateral movements have been avoided in order to prevent the fracture fragments from becoming dislocated.After being mounted on the radiolucent insertion device, the nail could be directlyimplanted into the femoral shaft. When there was a fracture line at the entry point, it wasn't an issue, but occasionally, after the nail was inserted, the fracture pieces displaced, mostly because the entry point was incorrect.The wire that serves as a guide for the PFNA blade has beenimplantedwithin the femoral neck via the aiming arm so that, in the AP view, the blade would have to be positioned in the center of the lateral view and the neck's lower region.When inserting the guide wire, caution must be used to avoid the subtrochanteric area'sfracture lineon the lateral aspect. In contrast to the PFN hip screw insertion, the PFNA blade was hammered in place.Sometimes the helical blade'sguide wire has been removed with the reamer following femoral neck reaming.The location of the reinserted guide wire beneath the image intensifier needed to be confirmed. Image intensifier control was used in these cases to carry out distal interlocking. The same team of skilled surgeons carried out each procedure. Blood loss, transfusion volume, and surgery duration were all noted. Under general or spinal anesthesia with antibiotic cover, every procedure was carried out.An injection of 500 milligrams of sulbactam and 1 gram of cefoperazone were administered at the time of anesthesia induction and continued for 3 days following surgery. Additionally, a prophylactic treatment for deep vein thrombosis was given. The degree of reduction was categorized as anatomical (10° varus/valgus and/or anteversion/retroversion).Following surgery, patients received early rehabilitation and were permitted to carry as much weight as they were able to tolerate.Following the procedure, all patients underwent routine physical and radiographic evaluations at six weeks, three, six, and twelve months.The Harris hip score has been utilized to evaluate the clinical outcomes.The Harris hip score was divided into four categories: fair (70 to 79 points), good (80 to 89 points), poor (69 points), and exceptional (90–100 points).Fracture healing was assessed using obliterated fracture lines and increased sclerosis. Clinical data was taken into consideration, particularly the absence of pain during weight bearing. while interpreting the X-rays.IBM SPSS Version 22.0 was utilized for the analysis of the gathered data. $P<0.05$ are regarded as statistically significant.

## RESULTS

24 patients with peritrochanteric fractures were investigated between April 2022 and April 2023, with a 60.8-year average age (range: 47–72 years). Six men and eighteen women participated in this study(FIG-1).19 patients (80%) suffered injuries as a result of self-fall, whereas 5 patients (20%) were involved in RTA(FIG-2).Based on the Boyd and Griffith classification, sixteen patients had type 2 fractures while 8 patients had type 3 fractures(TABLE-1,3). The range of time between the injury and operation has been1-4 days, with 2.1 days on average.Co-morbidities included seven patients (TYPE-2DIABETES MELLITUS(DM),HYPERTENISION(HTN) and ASTHMA(BA). With an average surgical time of one hour and 29 minutes (with a range of one hour to one hour and thirty-four minutes). and an average blood loss of 181 milliliters (with a range of 150 to 250 milliliters), 22 cases underwent closed nailing and 2 underwent open nailing(TABLE-3). The c-arm exposure time was 112.7 seconds on average (96-132

seconds). After nailing, the fracture union took 13 weeks and 7 days on average (range: 12-16 weeks). At six months, with a range of 78–94, the average Harris hip score was 86.2(TABLE-3). One patient experienced abductor lurch, which has been treated with physiotherapy; another patient suffered DVT, which was treated with medicine; and 2 patients experienced superficial infections, that settled when antibiotics were administered(TABLE-3).The following results were obtained when the Harrison hip score was used to assess the end results at the most recent follow-up: excellent − 5 (20.8%), good − 16 (66.6%), and fair − 3 (12.5%)(FIG-3,TABLE-2,3).Not one of our patients was excluded from follow-up.

DISCUSSION

Elderly people are particularly vulnerable to proximal femoral fractures, which are more common as the population ages and pose a serious risk to their health(2,3). Early, ideal surgical treatment for these fractures minimizes the chance of extended bed rest, lowers mortality as well as morbidity, and offers the optimal chance for early independence(1-3). The best implant for the peritrochanteric fracture treatment is still up for debate, despite the fact that there are several options available for fixation.Early mobilization by stable fixation with the least intrusive method possible is the crucial treatment objective(7). DHS(Dynamic Hip Screw) fixation is favored due to its biomechanical characteristics, that are thought to enhance the healing of features(8-10). DHS fixation requires comparatively greater exposure, anatomical reduction, andmore tissue manipulation; these factors raise the infection'srisk and serious blood loss, as well as the chance of varus collapse along with the implant's incapacity for survival till fracture union.The bone is mechanically weakened by the side plate and screws(9,10). Among the primary causes of fixation failure are osteoporosis, improper lag screw insertion in the femoral head, fracture instability, failure of the fixation device, and a lack of anatomical reduction.Compared to DHS-type implants, intramedullary implants for the internal fixation of the proximal femur can resist larger static loads as well as multiple times higher cycling loads(6-10). Consequently, the fracture heals without a preliminary medial support restoration(3). The implant temporarily replaces the medial column's functionality.Given their biomechanical characteristics, intramedullary devices tend to be the most suitable (i.e. their shorter lever arms and the reduced deforming forces throughout the implant).The GN (Gamma Nail), an intramedullary device currently in use, has a steep learning curve and a mechanical as well as technical failure rate of roughly ten percent (femur'sfracture, implant cut-out, and collapse of the fracture region) (9,11). To prevent these failures, the AO/ASIF group created the PFN, which has a smaller distal shaft diameter and an anti-rotational pin(5,6). However, the outcomes of using the PFN or GN to treat unstable trochanteric fractures were largely similar in a randomised, multicentre clinical, prospective trial. The risks and issues were comparable and mostly due to the surgeon or fracture, not the implant(12,13). But lag-screw cut-out is still a major issue, particularly in cases of less stable fracture patterns. Kyle et al. (15) observed reduced mechanical issues with the internal fixation of stable intertrochanteric hip fractures (AO/OTA A1) compared to more unstable patterns (AO/OTA A2/A3). However, no such complications were observed in our investigation. For their stable fractures, they recorded a 1.5% occurence of fixation failure on average, and for their unstable fractures, a 20% incidence.A 2% incidence of cut-out was found by Baumgaertner et al. (16) with a tip-apex gap of approximately 30mm. A tip-apex gap of more than 30mm was associated with a 27% incidence of cut-out; however, our investigation did not reveal any such issues.Wound complications, blood loss, soft tissue dissection, and infections have been minimized by PFNA [27–29]. Postoperative problems related to mechanical failure were minimal. There were no complications resulting from the mechanical failure.Currently, the most effective method to treat unstable trochanteric fractures without femoral head penetration is to use PFNA fixation. When used intramedullarily, it permits full and quick weight bearing after surgery as well as the metaphyseal fracture zone's controlled impaction. The blade of the helical column slides. Its form, compared to a screw, increases the area of contact between the implant and the bone, increasing the femoral head's blade purchase. By doing this, rotation-induced cut-outs are prevented, or at least postponed single column device and wire-guided insertion (due to cannulation) enable smooth and easy handling and must lower the possibility of issues with implants (14).

## CONCLUSION

The main aim of handling peritrochanteric fractures in elderly patients is to ensure a successful restoration of safe mobility. The achievement of this objective is contingent upon the strength and stability of the selected treatment construct. The Proximal Femoral Nail Antirotation technique emerges as an optimal and more straightforward implantation approach, enhancing fixation strength in the elderly population. Additionally, this technique is relatedto shorter operating times as well as minimal blood loss, making it a favorable choice for addressing peritrochanteric fractures in older individuals.

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**FIGURE 1-CHART BASED ON SEX DISTIBUTION**

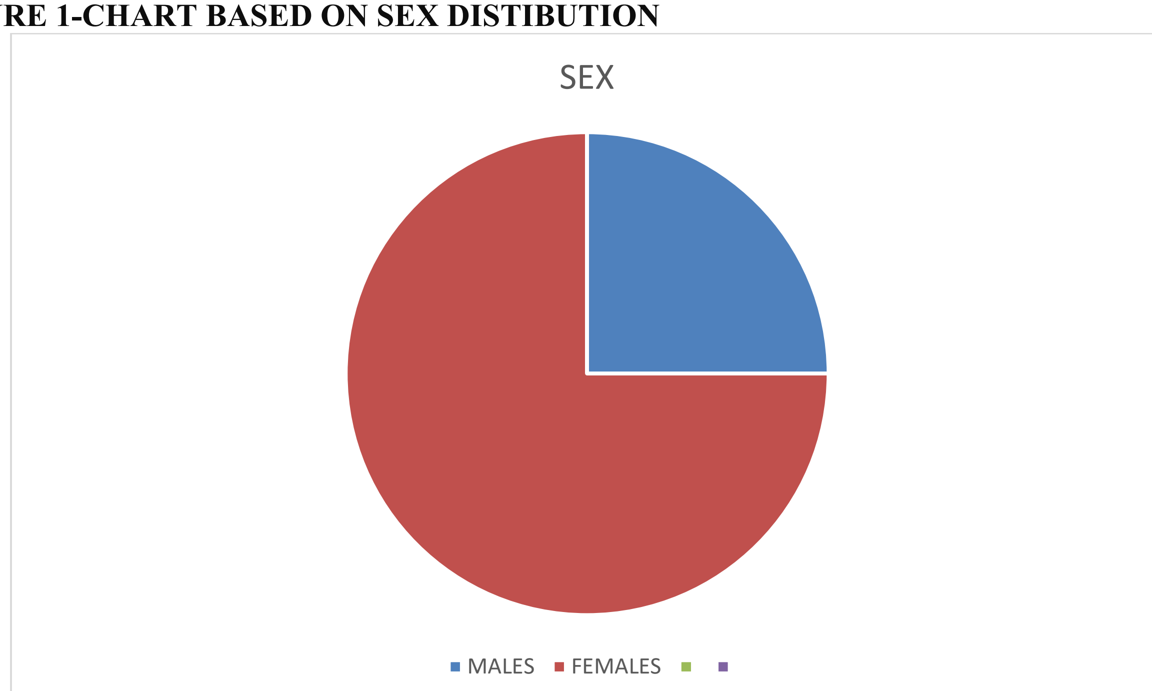


**FIGURE 2-CHART BASED ON MODE OF INJURY**

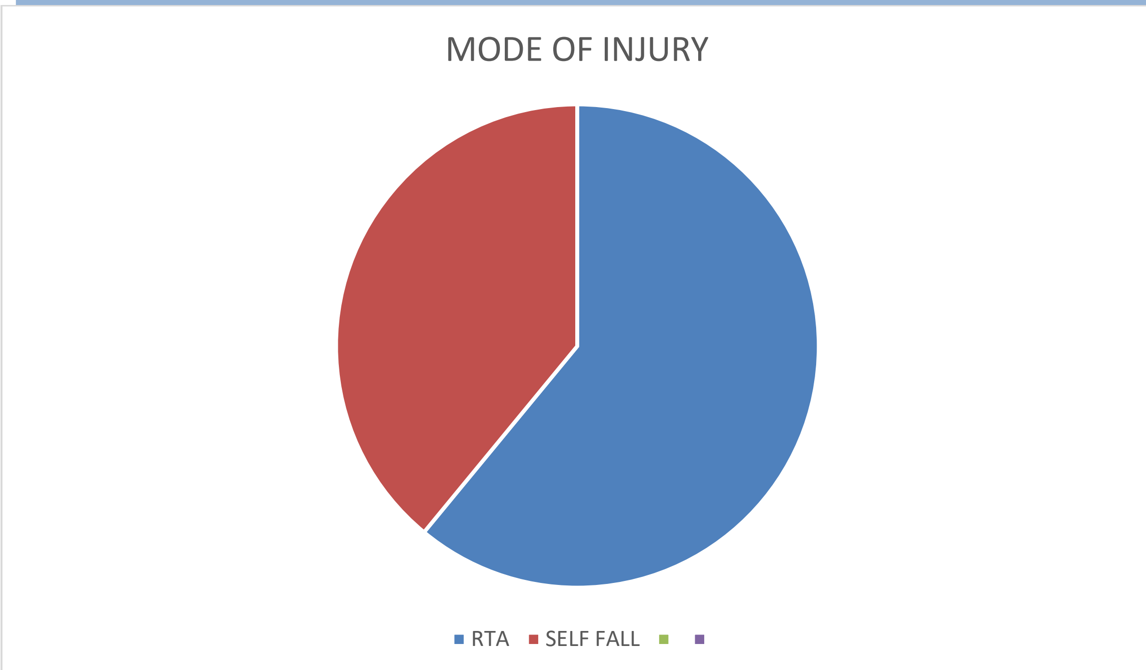


**FIGURE 3-CHART BASED ON HARRIS HIP SCORE**

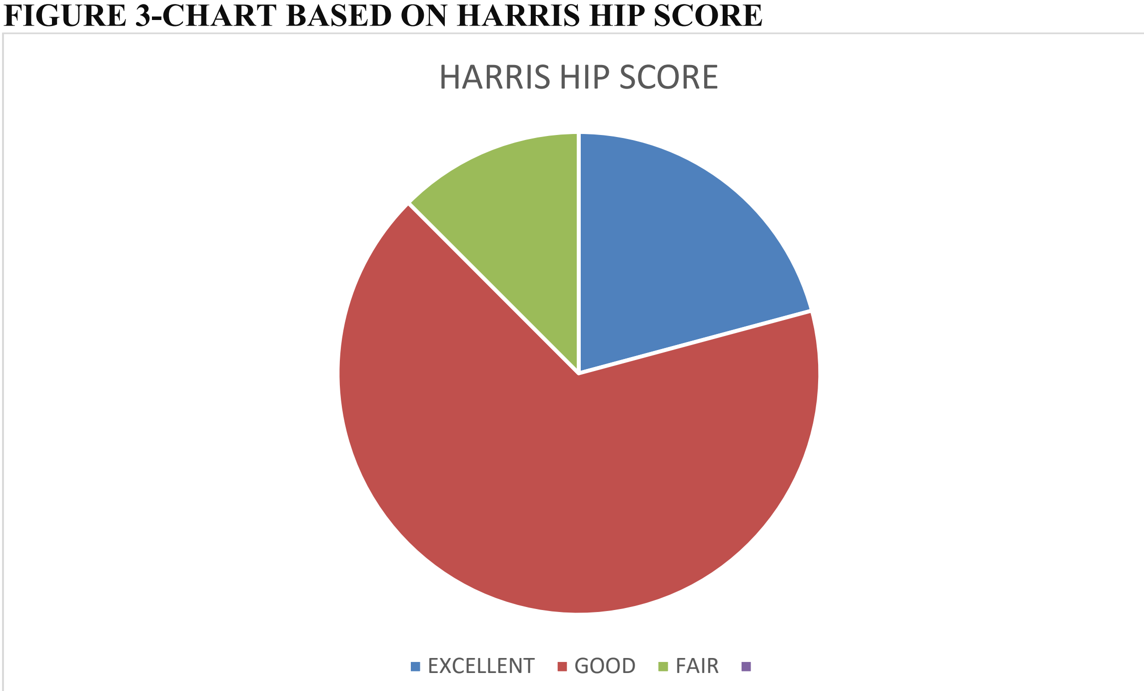


**TABLE 1-BOYD AND GRIFFIN CLASSIFICATION**

| BOYD AND GRIFFIN CLASSIFICATION | TYPE |
|---|---|
| TYPE-1 | STABLE TWO PART(NON DISPLACED) |
| TYPE-2 | COMMUNITED |
| TYPE-3 | COMMUNITED WITH SUBTROCHANTERIC EXTENSION |
| TYPE-4 | REVERSE OBLIQUITY FRACTURE |

**TABLE 2-HARRIS HIP SCORE**

| S.NO | PARAMETERS | GRADING |
|---|---|---|
| 1 | Pain | <70 points-Poor |
| 2 | Limp | 70-79 points-Fair |
| 3 | Distance | 80-89 points-Good |
| 4 | Support | 90-100 points-Excellent |
| 5 | Sitting | |
| 6 | Enter public transportation | |
| 7 | Stairs | |
| 8 | Put on shoes and socks | |
| 9 | Absence of deformity | |
| 10 | Range of motion | |

**TABLE-3 PATIENT DEMOGRAPHIC DETAILS**

| S. NO | AGE/ SEX | TYPE B AND G | INTERVAL B/W INJURY AND SURGERY(DAYS) | COMORBIDITIES | BLOOD LOSS(ML) | DURATION OF SURGERY (MINS) | C ARM EXPOSURE(SEC) | TIME TO BONE HEALING(WEEKS) | HARRIS HIP SCORE AT 6 MONTHS | COMPLICATIONS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 55/F | 3 | 1 | NIL | 150 | 72 | 105 | 12 | 88 | NIL |
| 2 | 62/F | 3 | 2 | DM,HTN | 200 | 90 | 110 | 15 | 85 | SUP.INFECTION |
| 3 | 58/F | 3 | 2 | NIL | 150 | 88 | 124 | 12 | 85 | NIL |
| 4 | 63/F | 2 | 2 | DM | 150 | 85 | 108 | 15 | 90 | NIL |
| 5 | 70/M | 3 | 4 | DM,HTN | 150 | 72 | 104 | 16 | 78 | DVT |
| 6 | 67/F | 2 | 3 | NIL | 200 | 85 | 110 | 14 | 88 | NIL |
| 7 | 58/M | 2 | 2 | DM | 200 | 85 | 107 | 14 | 85 | NIL |
| 8 | 64/F | 2 | 3 | BA | 150 | 72 | 104 | 15 | 86 | NIL |
| 9 | 58/F | 2 | 2 | NIL | 250 | 90 | 132 | 14 | 84 | NIL |
| 10 | 66/M | 2 | 2 | DM,HTN | 200 | 88 | 124 | 14 | 86 | SUP.INFECTION |
| 11 | 72/M | 2 | 4 | DM,HTN | 150 | 85 | 105 | 16 | 78 | ABDUCTOR LURCH |
| 12 | 69/F | 2 | 3 | DM,HTN | 250 | 94 | 105 | 13 | 88 | NIL |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 57/F | 3 | 2 | NIL | 200 | 86 | 124 | 13 | 86 | NIL |
| 14 | 63/F | 2 | 2 | HTN | 200 | 85 | 107 | 15 | 85 | NIL |
| 15 | 67/M | 3 | 2 | DM,HTN | 200 | 90 | 132 | 15 | 88 | NIL |
| 16 | 60/F | 2 | 2 | NIL | 250 | 72 | 98 | 14 | 91 | NIL |
| 17 | 59/F | 3 | 2 | NIL | 150 | 85 | 110 | 13 | 84 | NIL |
| 18 | 67/M | 2 | 3 | NIL | 150 | 88 | 118 | 16 | 78 | NIL |
| 19 | 66/F | 2 | 2 | NIL | 200 | 86 | 108 | 15 | 88 | NIL |
| 20 | 59/F | 2 | 2 | NIL | 200 | 94 | 118 | 13 | 84 | NIL |
| 21 | 52/F | 2 | 1 | NIL | 150 | 72 | 96 | 12 | 93 | NIL |
| 22 | 49/F | 2 | 1 | NIL | 150 | 85 | 132 | 12 | 88 | NIL |
| 23 | 52/F | 2 | 1 | NIL | 150 | 86 | 108 | 12 | 91 | NIL |
| 24 | 47/F | 3 | 1 | NIL | 150 | 88 | 118 | 12 | 94 | NIL |