The outcome for surgical fixation of distal radial fractures in patients with Idiopathic Parkinson's Disease: a cohort study

Te-Feng Chou
Taipei Veterans General Hospital
Chun Yao Chang
Taipei Veterans General Hospital
Chun-Ching Huang
National Taipei University of Nursing and Health Sciences
Ming-Chau Chang
Taipei Veterans General Hospital
Wei-Ming Chen
Taipei Veterans General Hospital
Tung-Fu Huang (Tungfu.huang@gmail.com)

Research article

Keywords: Level IV, Retrospective Cohort Study

Posted Date: January 24th, 2020

DOI: https://doi.org/10.21203/rs.2.21787/v1

Version of Record: A version of this preprint was published at Journal of Orthopaedic Surgery and Research on March 31st, 2020. See the published version at https://doi.org/10.1186/s13018-020-01642-5.

Abstract

Introduction

Idiopathic Parkinson's Disease (PD) is a progressive neurologic disorder causing postural instability and unsteady gait. These patients are at increased risk for fractures and have inferior outcomes after treatment. Several studies have evaluated the incidence and outcome of PD patients after hip fractures. However, there are limited studies assessing the outcome of upper extremity fractures in these patients. In this study, we evaluated the outcome of PD patients that received surgical intervention for distal radial fractures (DRF). We hypothesize that these patients have an inferior outcome after surgery in comparison with non-PD patients.

Methods

Between May 2005 through May 2017, we retrospectively reviewed all of the patients with DRF and subsequently underwent open reduction and internal fixation (ORIF) at a level 1 trauma center. All of the surgeries were performed by fellowship trained orthopedic surgeons. The inclusion criteria include patients with a definitive diagnosis of PD, non-pathological DRF and a minimum follow-up of 1 year. Each PD patient was matched for age and gender to 3 non-PD patients. The primary objective was to determine the failure rate after surgical fixation for DRF. The secondary outcomes include time to treatment failure, reoperation rate, readmission rate, length of hospital stay, and postoperative complications.

Results

A total of 88 patients were included in this study (23 PD, 65 non-PD patients). All underwent ORIF and received standard postoperative follow-ups. The overall treatment failure rate in PD was 39.1% vs. 4.6% in the non-PD group ($p<0.001$). The time to treatment failure were 9.11 ± 3.86 weeks and 14.67 ± 5.8 weeks for PD and non-PD, respectively ($p=0.028$). The length of hospital stay for PD was 5.3 ± 4.69 days compared with 3.78 ± 0.96 days for non-PD ($p=0.007$). There were 3 PD patients readmitted within 30 days after surgery, and 1 patient had pneumonia after the surgery.

Conclusion

This study revealed that patients with PD have a high treatment failure rate despite surgical intervention for DRF. PD patients had a longer hospital stay and had a shorter time to treatment failure. In treating PD patients complicated with DRF, the surgeon must take into consideration the complex disease course of PD and the associated comorbidities such as osteoporosis, frail status, unintentional tremor and frequent falls. Rehabilitation and disposition plans should be discussed in advance and longer hospital stays should be expected.

Introduction

Idiopathic Parkinson's Disease (PD) is a chronic, progressive neurologic disorder characterized by rigidity, postural instability and unsteady gait, leading to an increased risk for falls.[1] It is estimated that 70–87% of PD patients that are treated for longer than 20 years will have a fall injury.[1] In addition to motor symptoms, PD patients often are older, have a frail status and may concomitantly have osteoporosis making them susceptible to fractures.[2,3] It is estimated that these patients have almost two-folds of risk for fractures compared with the general population. In particular, hip fractures, forearm fractures and vertebral fractures are the most common types of fractures. [4] Several studies have evaluated the incidence and outcome of PD patients after different fractures, with most studies focused on hip fractures.[5] Most of the literature suggests that PD is an independent risk factor for inferior outcomes after a hip fracture with increased risks for mortality, reoperation, surgical complications and reduced mobility.[6, 7] Although hip fractures have been frequently discussed, limited studies have assessed the outcome of upper extremity fractures in PD patients. In particular, the Distal Radial Fracture (DRF) is the second most common fracture observed in this population.[4] Although current literature has noted a higher incidence of DRF in the elderly population, the appropriate treatment option for these patients remain controversial. The most recent American Academy of Orthopaedic Surgeons (AAOS) clinical practice guideline was unable to recommend for or against the treatment of distal radial fractures in elderly patients.[8, 9] If treated nonoperatively, the malunion rate can be as high as 89%.[10] For patients that received surgical intervention, poor wound healing, anesthesia related risks, and iatrogenic injuries are all concerns when treating the elderly.[8] With the significantly inferior outcome in the elderly, a comprehensive review to evaluate the outcome for DRF in PD is essential. In this study, we evaluated the outcome of PD patients that received surgical intervention for DRF and compared them with elderly patients without PD. We hypothesize that PD patients who sustained DRF will have inferior outcomes compared with non-PD patients.

Methods

This was a retrospective cohort study performed at a level 1 trauma center in Taipei, Taiwan. The study was approved by our hospital's institutional review board. The primary outcome of the study was to determine the treatment failure rate of PD patients after surgical intervention for DRF. The secondary outcome was to determine the time to treatment failure, associated injuries, reoperation rate, length of hospital stay, readmission rate within 30 days, and postoperative complications (eg. pneumonia, UTI, delayed wound healing). The inclusion criteria were as follows: patients that underwent surgical fixation for a DRF with either fracture type A, B, or C by the OTA/AO classification system, patients that were 18 years old or older and was able to tolerate anesthesia, and had a minimum follow-up for 1 year or up to the time where treatment failure was noted. We excluded patients that declined surgery, under 18 years of age, and open or complex pathological fractures.

Surgical Intervention and Patient Assessment

All of the included patients underwent open reduction and fixation (ORIF), either with plates, k-wires, external fixator (ESF) or a combination of the above methods. All of the surgeries were performed by fellowship trained orthopaedic surgeons. The choice of fixation method was determined based on the fracture pattern and the surgeon's preference. All of the patients received a standard perioperative protocol. The medical records were comprehensively reviewed for pertinent histories such as American Society of Anesthesiologist physical status (ASA) grade, diabetes, and smoking status. We evaluated each patient at 2 weeks, 1 month, 3 months and 12 months after the surgery. If treatment failure was noted prior to the final follow-up, the follow-up duration was recorded as the time of treatment failure. Standard posteroanterior and lateral radiographs were obtained immediately after the surgery and at each visit. At each visit, we assessed the patient's pain score with the Visual Analogue Scale (VAS). For radiographic assessment, we measured the radial inclination, articular step-off and palmar tilt for each visit. Treatment failure was considered if there was a loss of reduction, malunion or nonunion of the fracture. A loss of reduction is defined as a change in reduction in comparison to the immediate postop x-rays, including radial inclination > 5 of change, articular step-off > 2 mm and palmar tilt > 5 of change. A malunion was defined as persistent pain upon activity (VAS > 5) 3 months after the surgery and/or limited radiographic evidence of fracture healing 6 months postoperatively. All measurements and assessments were completed by two senior orthopaedic surgeons.

Pilot study and patient population size

A pilot study consisting of 40 patients (20 patients in each group) was first completed to determine the ideal sample size required to achieve an alpha level of 0.05 with 80% power. The failure rate noted in the PD group and non-PD group were 35% and 3% respectively. We then matched our patients in a 1:3 ratio (PD: non-PD) for age and gender. These results indicate that a study consisting 44 patients (12 patients: 36 patients) was required to achieve statistical significance.

Statistical analysis

All data were entered and analyzed with the SPSS software (version 25.0, SPSS Inc., Chicago, IL). We recorded data as mean, range and standard deviation for continuous variables and the student's t-test was used to compare the differences at appropriate times. For categorical data such as percentages, we used the chi-square test to assess for statistical significance. A p-value < 0.05 and confidence interval > 95% was considered to be statistically significant.

Results

After excluding the patients that did not meet the inclusion criteria, we enrolled a total of 88 patients in this study. There were 23 patients that had PD (mean disease duration 16.3 ± 2.1 months) with DRF and 65 non-PD patients with DRF. The mean follow-up duration was 8.83 ± 12.52 months.

Baseline characteristics

The mean age was 75.7 ± 6.96 and 71.1 ± 8.81 years in the PD and non-PD group respectively ($p = 0.11$). The percentage of female patients were 73.9% in the PD group and 75.4% in the non-PD group ($p = 0.89$). The mean age, gender ratio and ASA grade were similar in both groups. However, there was a significant difference in the fracture pattern between the groups. There was a significantly higher proportion of type C fractures (47.8% vs. 27.7%; PD : non-PD) for the PD patients, while there was a higher trend for type B fractures (4.3% vs 27.7%; PD : non-PD) in the non-PD patients ($p < 0.05$). For smoking history, the incidence was similar between the two groups. The baseline characteristics are shown in table 1.

Surgical method and outcome

The surgical method and outcome for both groups are shown in table 2. The patients in PD had a higher percentage of k-wire fixation (26.1% vs. 6.2%), while a higher rate of plating was noted for the non-PD patients (56.5% vs. 78.5%), ($p = 0.029$). A total of 39.1% of the patients in the PD group had treatment failure at a mean follow-up of 6.57 ± 6.6 months, while the failure rate was 4.6% in non-PD at mean follow up of 9.63 ± 14.0 ($p < 0.001$) months. The length of hospital stay was 5.3 ± 4.69 days for PD and 3.78 ± 0.96 days for non-PD ($p = 0.007$). There was one PD patient who had a reoperation within 30 days due to screw penetration which required removal of internal fixation. In comparison, there were no reoperations for non-PD. In terms of 30 day readmissions, there were 3 patients from PD that were readmitted (one patient required removal of implant, another patient received treatment for postoperative pneumonia, and another patient had a second fall accident causing a hip fracture that required surgical fixation). One patient had a wound infection in non-PD which required debridement and was admitted for intravenous antibiotic treatment.

Treatment failure and modes of failure

There were 39.1% of patients ($n = 9$) that had treatment failure in PD, and 4.6% ($n = 3$) in non-PD. The average time to treatment failure were 9.11 ± 3.86 weeks and 14.67 ± 5.8 weeks for the PD and non-PD group respectively ($p = 0.028$). The modes of failure are described in table 2. For PD patients, loss of reduction was seen in 17.4% of patients, fracture nonunion in 13.0% and persistent pain was observed after 3 months in 8.7% of patients.

Discussion

To our knowledge, this was the first cohort study to evaluate the outcome of DRF in PD patients. The most significant finding of this study was the substantially higher failure rate noted in PD (39.1% vs. 4.6%; $p < 0.001$). In current literature, there are many studies that have indicated PD patients are at increased risks for surgical complications after orthopaedic procedures.[2, 5, 6, 11]. Most studies have focused on hip fractures, and the outcome for DRF remains unknown.

The risk and outcome of fractures in patients with Parkinson’s Disease

Several large cohort studies have determined that PD patients are at increased risk for fractures.[4, 12] In addition, Pouwels et al. noted a 1.89 adjusted hazard ratio for risks of fracture in PD patients. In particular, fractures of the femur, forearm and vertebra were the most common fracture types in this patient population.[12] The increased risk can be attributed to several factors. First, PD patients are at increased risks for falls and 90% of fractures in the elderly are directly related to falls.[12] Additional factors including advanced age, multiple comorbidities and osteoporosis place PD patients at a significantly higher rate of fractures as well as postoperative complications.[5] On the other hand, several medication side effects also predispose PD patients to fractures. In particular, commonly used drugs such as monoamine oxidase-B (MAO-B) inhibitors, selective serotonin receptor inhibitors (SSRI) and high dose antipsychotics all significantly increases the risk of osteoporotic fractures.[4]

Most of the current studies for fractures in PD patients have focused on hip fractures. Roche et al. evaluated 2448 patients that sustained a hip fracture, 97 of whom had PD. Their results suggested PD was not a risk for 1-year mortality. On the other hand, several reports noted an inferior outcome for PD patients after sustaining a hip fracture with mortality rates as high as 47%.[7, 13] Karadsheh et al. reported PD as an independent predictor of mortality after operative treatment for femoral neck fractures. Interestingly, PD patients were more likely to sustain a dislocation after hemiarthroplasty and fixation failure for minimally displaced fractures.[7] The reoperation rates for PD were 4% and 22% for displaced femoral neck fractures and nondisplaced fractures respectively. Although the two groups received different surgical interventions, the significantly higher reoperation rates in the nondisplaced group prompted the authors to favor the use of hemiarthroplasties for non-displaced femoral neck fractures in PD patients.

Treatment failure for DRF is higher in PD patients

Although the majority of patients that receive surgical fixation for DRF have good to excellent outcomes, PD patients appear to have inferior results. In the general population, the nonunion rate is reported to be as low as < 1% and the overall complication rate in current literature for DRF ranges from 14–30% in the general population.[4, 14–16] In our study, we considered patients to have a treatment failure if there was loss of reduction, malunion or nonunion of fracture, or persistent pain at the injured site 6 months after surgery. We noted 4.6% of the non-PD patients had treatment failure, while 39.1% of the patients in the PD group were considered to have treatment failure. The cause for this substantially higher rate of treatment failure is currently unknown, but it is most likely multifactorial. For instance, PD patients often exhibit severe rigidity which may cause early failure of fixation.[17] Hence, there was a significantly higher rate of loss of reduction in the PD group. In addition, the frail status and frequent falls exhibited in this patient population may further complicate the postoperative recovery course.[7] Lastly, the frequent resting tremors observed in PD may also have altered the healing process. In order to facilitate optimal bone healing to occur, stabilizing the fracture either through relative stability or absolute stability is essential.[18] Although k-wire fixation and ESF are often considered to be relatively stable fixation techniques and provides fairly good outcomes in the general population, it should be used with caution in PD since the

frequent tremors may cause micro-instability over the fracture site which may impede proper fracture healing. In this study, there was a higher percentage of patients undergoing k-wire or ESF fixation in PD which could partly explain the higher rate of loss of reduction after ORIF (17.4% vs. 1.5%; for PD and non-PD respectively). Therefore, our authors recommend a rigid fixation method such as locked plates for PD patients in order to assure proper fracture healing.

Length of hospital stay and potential problems in caring PD patients

PD patients often have multiple comorbidities which may complicate their postoperative care. Pouwels et al. identified cancer, ischemic heart disease, and cerebrovascular disease as the three most common associated comorbidities in PD patients that have sustained a fracture.[4] In a comprehensive review of 9225 patients with hip fracture (452 patients with PD), Coomber et el. noted a significantly longer hospital stay for PD patients.[5] In-hospital complications were relatively common, of which postoperative delirium, pressure sores, pneumonia all occurred more often in patients with PD. In this study, PD patients were admitted in an acute orthopedic ward for 5.3 ± 4.69 days while non-PD patients had a shorter stay of 3.78 ± 0.96 days ($p = 0.007$). There was one PD patient complicated with aspiration pneumonia which required extended stay for treatment. For patients in the non-PD group, only one patient had wound dehiscence which was treated in under local anesthesia with debridement and primary closure of the wound. This patient was subsequently admitted for intravenous antibiotics. In addition to proper management of the DRF, detailed workup for osteoporosis and fall prevention measures is essential for PD patients. Since the bone mineral density in patients with PD is lower compared with healthy controls, appropriate medications such as bisphosphonates and denosumab should be initiated once osteoporosis is confirmed.[19]

There are several limitations in this study. This was a retrospective medical record review which may have certain bias due to the nature of the study design. In addition, there was a relatively small sample size for PD patients. In order to determine the adequate sample size, we conducted a pilot study to assure statistical significance was achieved. Furthermore, we matched our patients for age and gender in a 1 to 3 ratio with non-PD patients to overcome the relatively small sample size. Another limitation is that we did not assess the clinical function of our patients which could provide a better overall evaluation. Finally, Future studies should also include a group of PD patients that received nonoperative management after DRF to better assess the necessity of surgical fixation in this unique group.

Conclusion

In PD patients with a distal radial fracture, there was higher treatment failure rate in comparison to the non-PD group. PD patients tend to have longer hospital stays and a shorter time to treatment failure. Although internal fixation of DRF can be done with different instruments, we recommend plating of the radius over k-wire fixation for better outcomes. The treating physician must also take into account the complex disease course of PD and manage comorbidities such as osteoporosis, frail status, and

unintentional tremors accordingly. Rehabilitation and disposition plans should be discussed in advance and longer hospital stays should be expected.

Declarations

Ethics approval and consent to participate: this study was approved by our institutions IRB and all patients agreed to participate in this review and were consented accordingly.

Consent for publication: we agree to have this work publicized if accepted

Availability of data and materials: not applicable

Competing interests: the authors do not have any competing interests

Funding: this study did not receive any grants or funding

Authors' contributions: 1) Manuscript preparation: TFC, CYC, TFH

2) Study design: TFC, CYC, TFH

3) Interpretation of data: CCH, WMC, MCC

4) Statistical Analysis: TFC, CYC, TFH

Acknowledgements: we do not have acknowledgements

Abbreviations

PD
Parkinson’s Disease
DRF
Distal Radial Fractures
AAOS
American Academy of Orthopaedic Surgeons
ORIF
Open Reduction and Internal Fixation
ESF
External Fixator
ASA
American Society of Anesthesiologist
VAS
Visual Analog Scale
K-wires

References

1. Cheng KY, Lin WC, Chang WN, Lin TK, Tsai NW, Huang CC, et al. Factors associated with fall-related fractures in Parkinson's disease. Parkinsonism Relat Disord. 2014 Jan;20(1):88-92. Epub 2013/10/19.
2. Bezza A, Ouzzif Z, Naji H, Achemlal L, Mounach A, Nouijai M, et al. Prevalence and risk factors of osteoporosis in patients with Parkinson's disease. Rheumatol Int. 2008 Oct;28(12):1205-9. Epub 2008/07/02.
3. Nussbaum RL, Ellis CE. Alzheimer's disease and Parkinson's disease. N Engl J Med. 2003 Apr 3;348(14):1356-64. Epub 2003/04/04.
4. Pouwels S, Bazelier MT, de Boer A, Weber WE, Neef C, Cooper C, et al. Risk of fracture in patients with Parkinson's disease. Osteoporos Int. 2013 Aug;24(8):2283-90. Epub 2013/02/23.
5. Coomber R, Alshameeri Z, Masia AF, Mela F, Parker MJ. Hip fractures and Parkinson's disease: A case series. Injury. 2017 Dec;48(12):2730-5. Epub 2017/10/08.
6. Walker RW, Chaplin A, Hancock RL, Rutherford R, Gray WK. Hip fractures in people with idiopathic Parkinson's disease: incidence and outcomes. Mov Disord. 2013 Mar;28(3):334-40. Epub 2013/02/08.
7. Karadsheh MS, Rodriguez EK, Harris MB, Zurakowski D, Lucas R, Weaver MJ. Mortality and Revision Surgery Are Increased in Patients With Parkinson's Disease and Fractures of the Femoral Neck. Clin Orthop Relat Res. 2015 Oct;473(10):3272-9. Epub 2015/03/25.
8. Egol KA, Walsh M, Romo-Cardoso S, Dorsky S, Paksima N. Distal radial fractures in the elderly: operative compared with nonoperative treatment. J Bone Joint Surg Am. 2010 Aug 4;92(9):1851-7. Epub 2010/08/06.
9. Diaz-Garcia RJ, Oda T, Shauver MJ, Chung KC. A systematic review of outcomes and complications of treating unstable distal radius fractures in the elderly. J Hand Surg Am. 2011 May;36(5):824-35 e2. Epub 2011/04/30.
10. Arora R, Gabl M, Gschwentner M, Deml C, Krappinger D, Lutz M. A comparative study of clinical and radiologic outcomes of unstable colles type distal radius fractures in patients older than 70 years: nonoperative treatment versus volar locking plating. J Orthop Trauma. 2009 Apr;23(4):237-42. Epub 2009/03/26.
11. Melton LJ, 3rd, Leibson CL, Achenbach SJ, Bower JH, Maraganore DM, Oberg AL, et al. Fracture risk after the diagnosis of Parkinson's disease: Influence of concomitant dementia. Mov Disord. 2006 Sep;21(9):1361-7. Epub 2006/05/17.
12. Genever RW, Downes TW, Medcalf P. Fracture rates in Parkinson's disease compared with age- and gender-matched controls: a retrospective cohort study. Age Ageing. 2005 Jan;34(1):21-4. Epub 2004/12/14.

13. Coughlin L, Templeton J. Hip fractures in patients with Parkinson's disease. Clin Orthop Relat Res. 1980 May(148):192-5. Epub 1980/05/01.
14. Prommersberger KJ, Fernandez DL. Nonunion of distal radius fractures. Clin Orthop Relat Res. 2004 Feb(419):51-6. Epub 2004/03/17.
15. Hess DE, Carstensen SE, Moore S, Dacus AR. Smoking Increases Postoperative Complications After Distal Radius Fracture Fixation: A Review of 417 Patients From a Level 1 Trauma Center. Hand (N Y). 2018 Nov 22:1558944718810882. Epub 2018/11/23.
16. Arora R, Lutz M, Hennerbichler A, Krappinger D, Espen D, Gabl M. Complications following internal fixation of unstable distal radius fracture with a palmar locking-plate. J Orthop Trauma. 2007 May;21(5):316-22. Epub 2007/05/09.
17. Mattson JT, Louis DS. Intrapelvic migration of a threaded Steinmann pin in Parkinson's disease. Clin Orthop Relat Res. 1976 Nov-Dec(121):166-8. Epub 1976/11/01.
18. Jagodzinski M, Krettek C. Effect of mechanical stability on fracture healing–an update. Injury. 2007 Mar;38 Suppl 1:S3-10. Epub 2007/03/27.
19. Gao H, Wei X, Liao J, Wang R, Xu J, Liu X, et al. Lower Bone Mineral Density in Patients with Parkinson's Disease: A Cross-Sectional Study from Chinese Mainland. Front Aging Neurosci. 2015;7:203. Epub 2015/11/19.

Tables

Table 1. Patient characteristics

	Overall	Patients with PD (n=23)	Patients w/o PD (n=65)	p-value
Age (years)	72.35 ± 8.57	75.7 ± 6.96	71.1 ± 8.81	0.11
Female patients (%)	66 (75.0%)	17 (73.9%)	49 (75.4%)	0.89
Fracture type (AO/OTA)*				<0.05
Type A	40 (45.5%)	11 (47.8%)	29 (44.6%)	
Type B	19 (21.6%)	1 (4.3%)	18 (27.7 %)	
Type C	29 (33.0%)	11 (47.8%)	18 (27.7%)	
ASA grade				0.78
Class I/II	9 (10.2%)	2 (8.7%)	7 (10.8%)	
Class III/IV	79 (89.8%)	21 (91.3%)	58 (89.2%)	
Smoking history	16 (18.2%)	5 (21.7%)	11 (16.9%)	0.61
PD duration (months)	X	16.3 ± 2.1	X	X
Follow-up duration (months)	8.83 ± 12.52	6.57 ± 6.56	9.63 ± 14.0	0.18

* Fracture type was assessed using the AO/OTA classification 2007

[1] ASA: American Society of Anesthesiologist physical status classification system 2014

[2] PD: Parkinson’s Disease

Table 2. Perioperative data

	Overall	Patients w/ PD	Patients w/o PD	p-value
Number of patients	88	23	65	
Surgical intervention				0.029
K-wires	10 (11.4%)	6 (26.1%)	4 (6.2%)	
External Fixation	14 (15.9%)	4 (17.4%)	10 (15.4%)	
Plate	63 (72.7%)	13 (56.5%)	51 (78.5%)	
Outcome				<0.001
Union	76 (86.4%)	14 (60.9%)	62 (95.4%)	
Treatment failure	12 (13.6%)	9 (39.1%)	3 (4.6%)	
Modes of failure				<0.05
Loss of reduction	5 (5.7%)	4 (17.4%)	1 (1.5%)	
Nonunion of fracture	4 (4.5%)	3 (13.0%)	1 (1.5%)	
Persistent pain	3 (3.4%)	2 (8.7%)	1 (1.5%)	
Time to failure (weeks)	10.5 ± 4.14	9.11 ± 3.86	14.67 ± 5.8	0.028
Associated injuries	6 (6.8%)	3 (13%)	3 (4.6%)	0.168
Reoperation	1 (1.1%)	1 (4.3%)*	0	X
Length of stay (days)	4.42 ± 2.59	5.3 ± 4.69	3.78 ± 0.96	0.007
Readmission (<30 days)	4 (4.5%)	3 (13.0%)	1 (1.5%)	X
Complications	2 (2.2%)	1 (4.3%)	1 (1.5%)	X
Pneumonia	1 (1.1%)	1 (4.3%)	0	
UTI	0	0	0	
Wound	1 (1.1%)	0	1 (1.5%)	
Mortality	0	0	0	
Thromboembolism	0	0	0	

[1]PD: Parkinson's Disease

[2]UTI: Urinary tract infection

* Screw cutout leading to early removal of implant