# Hip disarticulation: a case series

**Abstract**: Hip disarticulation is a surgical procedure involving the amputation of the entire lower limb through the hip joint. This study contains 13 patients who had undergone hip disarticulation, 76.9% due to infection, while the rest were as a result of trauma. The mean age for the trauma group was 34 and for infective causes 53. Smokers accounted for 38.5% of patients. The most common bacteria found were *Staphylococcus aureus* and *Klebsiella pneumonia*. The diagnosis for patients who underwent hip disarticulation due to infection were necrotizing fasciitis (n=3) and infected diabetic foot (n=7). The mortality rate was 61.5% and three patients experienced a phantom limb. All five survivors used wheelchairs for ambulation and with no prosthesis.

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Hip disarticulation is a surgical procedure involving the amputation of the entire lower limb through the hip joint (Loon,1957). It is one of the most extensive procedures in orthopaedic surgery (Dillingham et al, 2002). Hip disarticulation accounts for approximately 0.5% of the lower limb amputation procedures performed (Dillingham et al, 2002). Hip disarticulation was first successfully performed in 1774 by Perall on a man named Gois, who had his right thigh crushed between a wall and the wheel of a cart leading to gangrene (Cox, 1845). The most common indication for this procedure is highly invasive tumours of musculoskeletal system, peripheral vascular disease and severe trauma, as well as severe musculoskeletal infection of the pelvic and lower limb regions (Dillingham et al, 2002). The mortality rate among patients who underwent hip disarticulation surgery is reported to be 44% (Moura and Garruço, 2017).

## Material and method

This cross-sectional study was carried out by reviewing the records of patients who underwent hip disarticulation in Hospital Teluk Intan during the 40 month period of January 2017 to May 2020. There were no exclusion criteria for this study. Patients who underwent hip disarticulation were selected and data such as demographics, comorbidities, operation procedures, microbiology, type of dressings, physical wound appearance, length of hospital stay and phantom limb symptoms were collected, compiled and examined.

## Results

Our study comprises 13 patients who underwent hip disarticulation, eight males and five females. The main cause of hip disarticulation was infection (76.9%), while the rest were as a result of trauma. The trauma patient group consisted of two males and one female. Of the 13 patients, seven were Malay, four Indian, one Orang Asli (indigenous Malay people) and one Bangladeshi. The age range of the trauma group was 20 to 42 years old with a mean age of 34. Infective patient's age was from 39 to 68 with a mean age of 53. Out of the 13 patients, three were employed and the rest were unemployed or homemakers.

Comorbidities for the infection group were diabetes (n=9), hypertension (n=6), a previous above-knee amputation before the hip disarticulation (n=6), heart disease (n=1), chronic kidney disease (n=1) and hepatitis C (n=1) *(Figure 1)*. Among the three trauma patients, one had diabetes while the others had no known comorbidity. Out of 10 patients who had diabetes, six were being treated with insulin and four were on oral hypoglycaemic agents. There were 38.5% who smoked (*n*=5), all of which were male.

Both the pre-hip disarticulation 1–2 operative procedure group and the post-hip disarticulation with more than five operative procedure

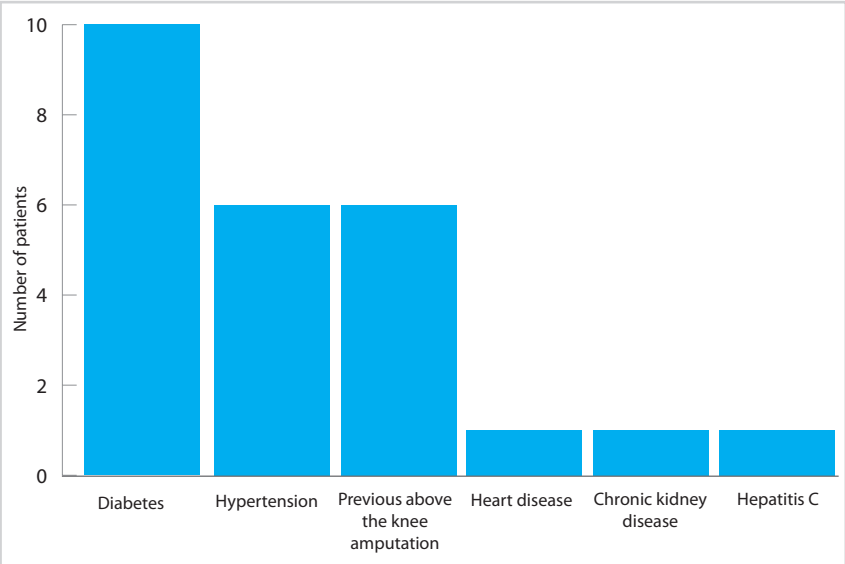


*Figure 1. Comorbidites among hip disarticulation case*

are 38% of total patient *(Figure 2)*. There were three patients who underwent a multilevel amputation of a single limb, in one admission, before hip disarticulation. Post-hip disarticulation four patients did not undergo any surgical procedure, six patients had 1–2 procedures, two patients had 3–5 procedures, and one patient had more than five procedures *(Figure 2)*. Looking at the total white cell count, 67% of patients had more than 20 x$10^3$/$mm^3$, the highest white cell count was 42x$10^3$/$mm^3$. The most common microorganisms detected were *Staphylococcus aureus* and *Klebsiella pneumonia (Table 1)*. The diagnosis of patients who underwent hip disarticulation due to infection were due to necrotizing fasciitis (n=3) and an infected diabetic foot (n=7).

Late presentation to hospital is considered a hospital visit after two weeks or more of symptoms; in this study six patients presented late to the hospital. The length of hospital stay is defined as the day of admission to date of discharge or death. We specifically looked into the length of hospital stay for the patients that survived and were discharged. The hospital stay for surviving patient was between 11 and 73 days, with a mean of 31 days. Mean hospital stay for those that died was 46 days (range: 5–102 days). There was a 61.5% mortality rate among the 13 patients who underwent hip disarticulation. Out of the eight patients that passed away, 50% were due to infection at the amputation site. Of the five survivors, one was treated with Medihoney (Derma Science), one with Dermasyn (Dyamed Biotech) and three with polyvinylpyrrolidone (Steriline). There were three patients who experienced the sensation of a phantom limb and 100% of the survivors used a wheelchair for ambulation with no prosthesis.

**Table 1. Microbiology of infections treated by disarticulation of the hip**

| Pathogen | Number |
|---|---|
| **Gram-positive cocci (*n*=4)** | |
| *Staphylococcus aureus* — oxacillin resistant | 2 |
| *Staphylococcus aureus* — oxacillin sensitive | 1 |
| *Staphylococcus epidermidis* | 1 |
| **Gram-negative rods (*n*=8)*** | |
| *Klebsiella pneumonia* | 3 |
| *Enterobacter cloacae* | 1 |
| *Enterobacteragglomerans* | 1 |
| *Pseudomonas aeruginosa* | 1 |
| *Acinobacter* sp. | 2 |
| *Escherichia coli* | 1 |
| * One patient tested positive for two Gram-neagtive bacteria | |

## Discussion

The most common lower limb amputations performed are transtibial and transfemoral amputation. However, in patients with proximal thigh life-threatening infections, trauma or malignancy, hip disarticulation is necessary for survival of the patient (Moura and Garruço, 2017). Hip disarticulation accounts for approximately 0.5% of the lower limb amputations performed (Dillingham et al, 2002). Gender is known to affect major amputation rates and is significantly higher in men; the majority of hip disarticulation case are performed in males (61.5%) (Davie-Smith et al, 2017). Moreover, higher smoking rates in men is a strong contributing factor for amputation (Davie-Smith et al, 2017). All the patients who smoke in this study were male. Significant arterial compromise requiring amputation of lower limbs can be seen in heavy smokers (Stewart, 1987). Men with diabetes are also noted to have higher risk for lower limb amputation (Prompers et al, 2006).

In this case series the mean age for trauma cases was 34-years-old and for infection 53-years-old. Our youngest trauma patient was 20-years-old and underwent hip disarticulation having presented with a mangled lower limb. This was slighter higher when compared with Takahira et al (2002), where the youngest trauma patient was 14-years-old. The youngest age in the infection group is 39, higher than the

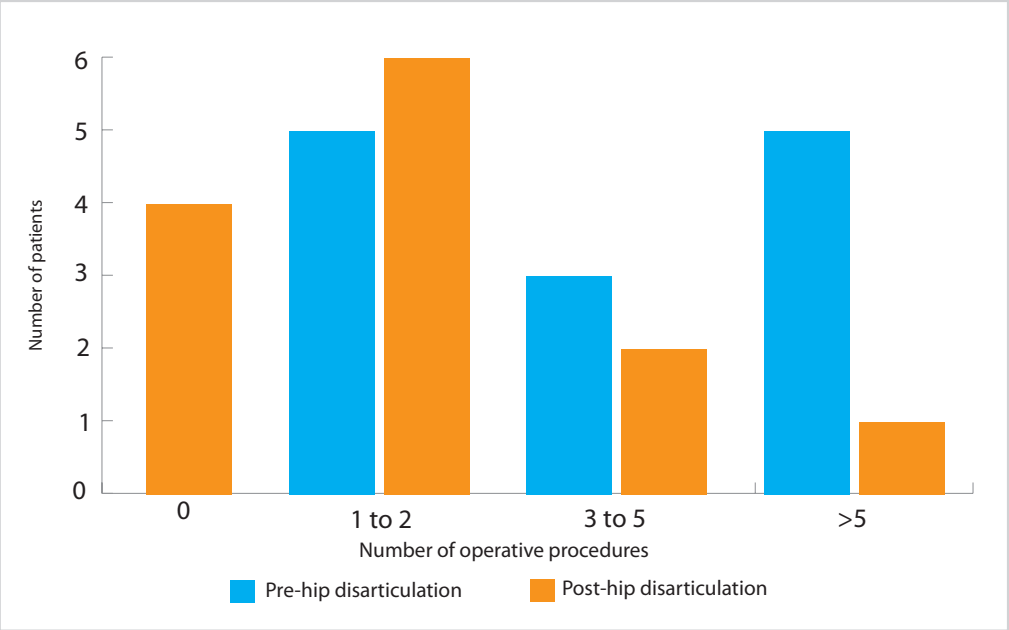


*Figure 2. Number of operative procedures pre and post hip disarticulation*

youngest patient reported by Endean et al (1991). In their case series, of 53 hip disarticulation patients, performed over 24 years, the youngest age among the infection group was 19-years-old.

Endean et al (1991) reported that of the 53 patients, 13 had diabetes, 19 heart disease, 27 were smokers, 11 had hypertension and prior above-knee amputation was reported in 11 patients. Zalavras et al (2009) reported that in 15 hip disarticulation cases, seven suffered from intravenous drug abuse, six had diabetes, one had hepatitis B, one had hepatitis C, and four were smokers. In this case series of 13 patients, 10 had diabetes, six had hypertension, previous above-knee amputation prior to hip disarticulation was reported in six patients, one had heart disease, one had chronic kidney disease and one patient had hepatitis C. Of the 13 patients, five were smokers. It is noted that comorbidities of diabetes, heart disease, hypertension, previous above-knee amputation and hepatitis C are all risk factors that increase morbidity in patients that require hip disarticulation.

Endean et al (1991) indications were tumours (n=17), ischaemia associated with infection (n=14), infection (n=12) and ischaemia (*n*=10). Moura and Garruço (2017) reported that in a series of 16 patients who underwent hip disarticulation, performed over 16 years, their comorbidities were infection (n=6), tumour (n=5), trauma (n=3), and ischaemia (n=2). In this case series, indication for hip disarticulation was infection (n=10) and trauma (n=3). This may be limited to trauma and infections because most tumour or malignancy cases are referred to tertiary centres for further management. All those who underwent hip disarticulation due to infection had a ankle brachial systolic index (ABSI) range of 0.6–08. Diabetes was well controlled on the ward, however all of the patients had poor control before admission. Out of 10 patients with diabetes, six were on insulin and four were on oral hypoglycemic agent. The diagnosis of patients who underwent hip disarticulation due to infection were necrotising fasciitis (n=3) and an infected diabetic foot (n=7).

Before hip disarticulation five patients underwent more than five procedures and one patient underwent more than five procedures post hip disarticulation. Endean et al (1991) recommended early operation for limb ischaemia and/or infection to avoid the need for hip disarticulation and associated complications. However, if it is apparent an above-knee amputation is non-viable, hip disarticulation should not be delayed. There were five patients who underwent multiple procedures before hip disarticulation because of surgical expertise; three patients were operated on by junior medical officers with less than five year's experience, and two patients were operated on by a senior medical officer with more than five year's experience. There were three patients who underwent multilevel amputation in a single admission before hip disarticulation.

Moura and Garruço (2017) and Zalavras et al (2009) reported the common

microorganisms in hip disarticulation patients are *Staphylococcus aureus*. In our case series, common microorganisms were *Staphylococcus aureus* (n=3) and *Klebsiella pneumonia* (n=3). The main antibiotics used are IV Ampicillin+Sulbactam and IV Tazocin. The mean hospital stays of patients who survived hip disarticulation is 31 days (11–73 days). The duration is slightly longer than reported by Zalavras et al where the patients persistent nature and extent of the infection in the proximal thigh, which precluded control by local debridement and/or more distal level of amputation, had a mean hospital stay of 24 days (6–49 days) (Zalavras et al, 2009). Some patients were admitted longer postoperatively on the ward for wound management. However, although receiving proper wound management the patients did not survive due to non-infectious complications.

The reported mortality rate varies, Unruh et al (1990) reported a 44% mortality rate overall in hip disarticulation, which was higher in those with infection: 12/23 patients with preoperative infection died, compared with 3/11 patients without infection. Endean et al (1991) reported a mortality rate of 33% (10/30 patients died) when it was performed as an emergency, compared with 4% (1/23 patients died) when performed electively. Our mortality rate is 61.5% which is higher compared with both studies, as 84.6 % of cases had infection (11/13 patients) and all cases were performed as an emergency operation. Moreover, 4 out of 8 mortality cases were not due to the original infection at the hip disarticulation site. Out of these four cases, two were non-preventable deaths due to acute myocardial infraction and two were preventable deaths, one caused by hospital acquired pneumonia and the other infected sacral pressure ulcer (PU). These could be have been avoided with regular chest and limb physiotherapy, hourly turning, regular inspection of high-risk area for PUs and a ripple mattress. The role of physiotherapy is vital in stopping preventable deaths.

Out of the five surviving patients, none of them used a prosthesis and all used a wheelchair for ambulation. Nowroozi et al (1983) reported walking energy consumption is 82% higher in hip disarticulation patients compared with normal individuals. Therefore, patients are more comfortable with wheelchair ambulation compared with prosthetic usage. Limitations of the rehabilitation service in the hospital also contribute to a lack of prosthetic usage. The five survivors of hip disarticulation were treated with regular dressing changes for a mean of 95 days before full wound closure. WAS

## Conclusion

Hip disarticulation is a radical and extensive orthopaedic emergency lifesaving surgical procedure, which should be carried out early for a better prognosis. Our recommendation is to seek early medical consultation, so that the decision for hip disarticulation can be made before sepsis sets in. Hip disarticulation is a reasonable option and should be considered for treating severe infections of the lower extremity. More impact and newer studies are needed to increase knowledge and insight into the effect of post-hip disarticulation surgical procedures, which play an important role in the overall outcome of patients.

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