MEDICAL SCIENCE

Epidemiology of intertrochanteric hip fractures at a state hospital in Malaysia

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ABSTRACT

Background: Intertrochanteric fractures are amongst the most common hip fractures in older adults and are most commonly caused by low-energy trauma. This study aims to identify the causes, demographic information, and presence of comorbidities among patients admitted with intertrochanteric hip fractures at a state hospital in Malaysia. *Methods:* Patients with intertrochanteric fractures presenting to Hospital Tuanku Ja'afar Seremban, Malaysia, from January 2019 to December 2021 were identified from a retrospective trauma database. Patient data were analyzed using IBM SPSS version 28 for logistic regression. Statistical significance was set at $p<0.05$. *Results:* A total of 306 patients were included in this study. The mean age of patients was 69.9 ± 16.4 years, with 51.6% female. 78.8% (n= 241/306) of patients had comorbidities. Most fractures were caused by a same-level fall (67.3%) at the patient's accommodation. 258 patients underwent surgical management, 17 developed postoperative complications, and had underlying comorbidities. *Conclusion:* Intertrochanteric fractures are most commonly seen in females and the elderly population. Early screening of comorbidities and implementing fall prevention strategies may help reduce fracture incidence.

Keywords: Epidemiology, intertrochanteric, hip fracture, comorbidity, fall prevention

1. INTRODUCTION

Intertrochanteric fracture is a proximal femur fracture occurring between the greater and lesser trochanter, which may or may not involve extension into the upper femoral shaft (Kumar et al., 2012; Attum and Pilson, 2021). It poses a significant challenge to public health as it can cause disabilities that adversely impact the quality of life and increase mortality rates. Intertrochanteric femur fractures constitute nearly half of hip fracture incidents in older adults (Sharma et al., 2017). In 1990, intertrochanteric fractures accounted for 26% of hip fractures in Asia (Jonnes et al., 2016). In recent decades, the incidence of these fractures has increased significantly, primarily due to global population aging and the increase in cases of

osteoporosis worldwide (Jonnes et al., 2016).

Commonly, these fractures are managed surgically (Attum and Pilson, 2021). Conservative management is used only in patients with multiple comorbidities and patients who are unfit for surgery. Internal fixation with dynamic hip screw (DHS) or proximal femoral nail (PFN) is the operative treatment modality of choice for intertrochanteric femoral fractures, with DHS currently regarded as the gold standard for evaluating outcomes (Sharma et al., 2017; Avakian et al., 2012).

Several epidemiological studies have been carried out to evaluate the incidence, risk factors, and outcomes associated with intertrochanteric fractures. It was found that most patients who suffer from intertrochanteric fractures are females and elderly individuals (Pillai et al., 2011; Mattisson et al., 2018). Many patients suffered intertrochanteric fractures due to same-level falls at the patient's residence (Mangram et al., 2014; Hagino et al., 2017; Mattisson et al., 2018).

Furthermore, multiple studies have shown that individuals with underlying comorbidities have an increased risk of falling, leading to a higher incidence of intertrochanteric fractures (Ong et al., 2020; Abu-Bakar et al., 2021). Patients with underlying comorbidities also had a higher risk of developing postoperative complications, besides an increased mortality rate (Roche et al., 2005). Therefore, this study aimed to identify the causes, demographic information, and presence of comorbidities among patients admitted with intertrochanteric hip fractures at a state hospital in Malaysia.

2. MATERIALS AND METHODS

Study design and setting

This retrospective descriptive epidemiological study was to collect information on patients with intertrochanteric fractures of the femur who were scheduled to undergo surgical management from January 2019 to December 2021 in Hospital Tuanku Ja'afar Seremban. After receiving approval from the National Medical Research Register (NMRR), the director of Hospital Tuanku Ja'afar Seremban, and the head of the Department of Orthopedics, detailed patient data was assessed and collected through the hospital patient database.

The inclusion criteria in this study were patients scheduled for intertrochanteric fracture with DHS or PFN from January 2019 to December 2021 at Hospital Tuanku Ja'afar Seremban. A total of 306 patients were identified and included in this study. Exclusion criteria were patients below the age of 18.

Variables

Patient data related to the epidemiology (age, sex, race, and comorbidities), injuries (location, mechanism, and date), and hospitalization (fracture type, treatment modality, waiting duration before surgery, postoperative hospital stay, and postoperative complications) were collected from the hospital patient database.

In our study, the patient's injury location was divided into the patient's accommodation, public area, on the road, or unspecified location. The mechanism of injury was categorized as same-level fall, fall from a height, motor vehicle accident, unspecified cause, and others. The energy level of the trauma was further classified into high energy, low energy, or unspecified. Fractures were grouped into closed and open fractures. Stable/unstable and AO/OTA classifications were not followed due to insufficient radiological results and documentation. Surgical implants categorized as DHS, short PFN, long PFN, and others, as well as the brand of the implant, were recorded. The date of admission and discharge were included in this study to estimate the duration of the hospital stay. Early and late postoperative complications of the surgery were included in this study.

Statistics

All the data collected were analyzed using IBM SPSS version 28 for logistic regression. Statistical significance was set at $p<0.05$. The results were standardized by analyzing the collected data from our questionnaire with data from similar studies published in peer-reviewed journals.

3. RESULTS

Patient epidemiology and mechanism of injury

This study included 306 patients identified from the hospital database who met the inclusion criteria. Among these, female patients account for most of the patients (51.6%, n = 158/306), and the mean age (±SD) for all the patients was 69.9 ± 16.3 years. Females had a higher mean age of 76.0 ± 9.8 years, while the mean age for males was 63.5 ± 19.3 years. Regarding race, there were 44.1% (n= 135/306) Malays, 27.8% (n=85/306) Malaysian Chinese, 26.8% (n=82/306) Malaysian Indians, and 1.3% (n=4/306) other races. The distribution of fractures between age groups and gender is described in Figure 1.

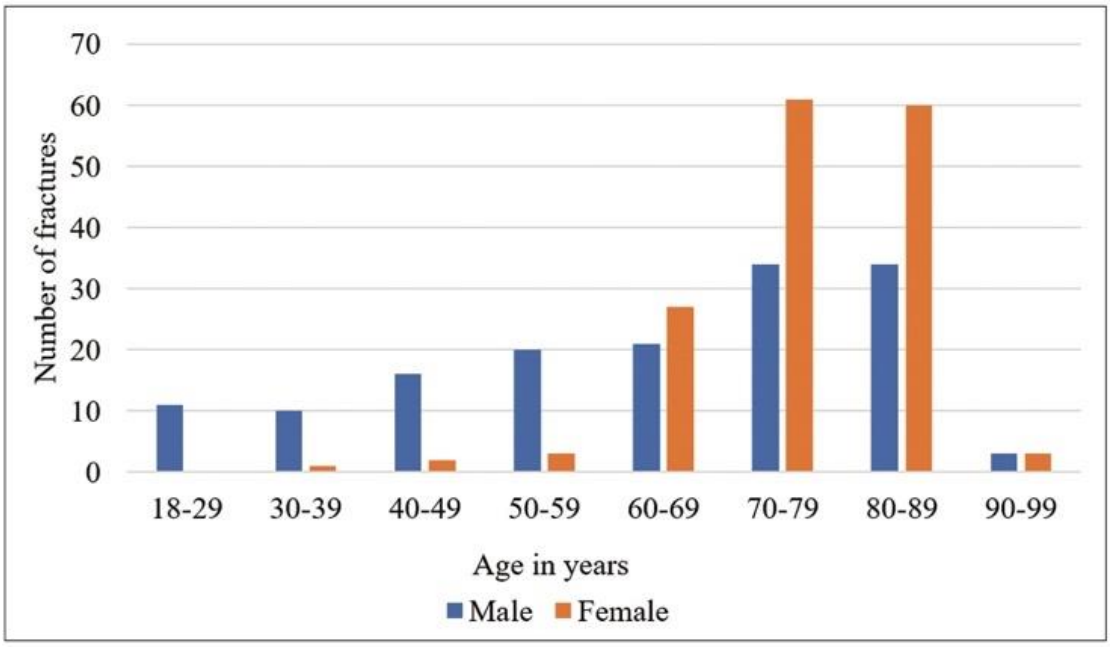

Figure 1 Incidence of intertrochanteric hip fractures according to age group and gender.

The trauma occurred at the patient's accommodation in 67.3% (n =206/306) of the cases, while 6.9% (n =21/306) in a public area, 16.7% (n = 51/306) on a road and 9.2% (n =28/306) at an unspecified location. Among the causes of injury, 69.9% (n=214/306) were attributed to same-level falls, 15.0% (n =46/306) were fractures sustained from motor vehicle accidents, 5.6% (n =17/306) were falls from a height, 2.3% (n =7/306) were unspecified falls and 7.2% (n =22/306) had other causes of injury that lead to the fractures. December and October had the highest number of incidents of intertrochanteric hip fractures, with 40 and 36 fractures, respectively, while August had the least fractures (Figure 2).

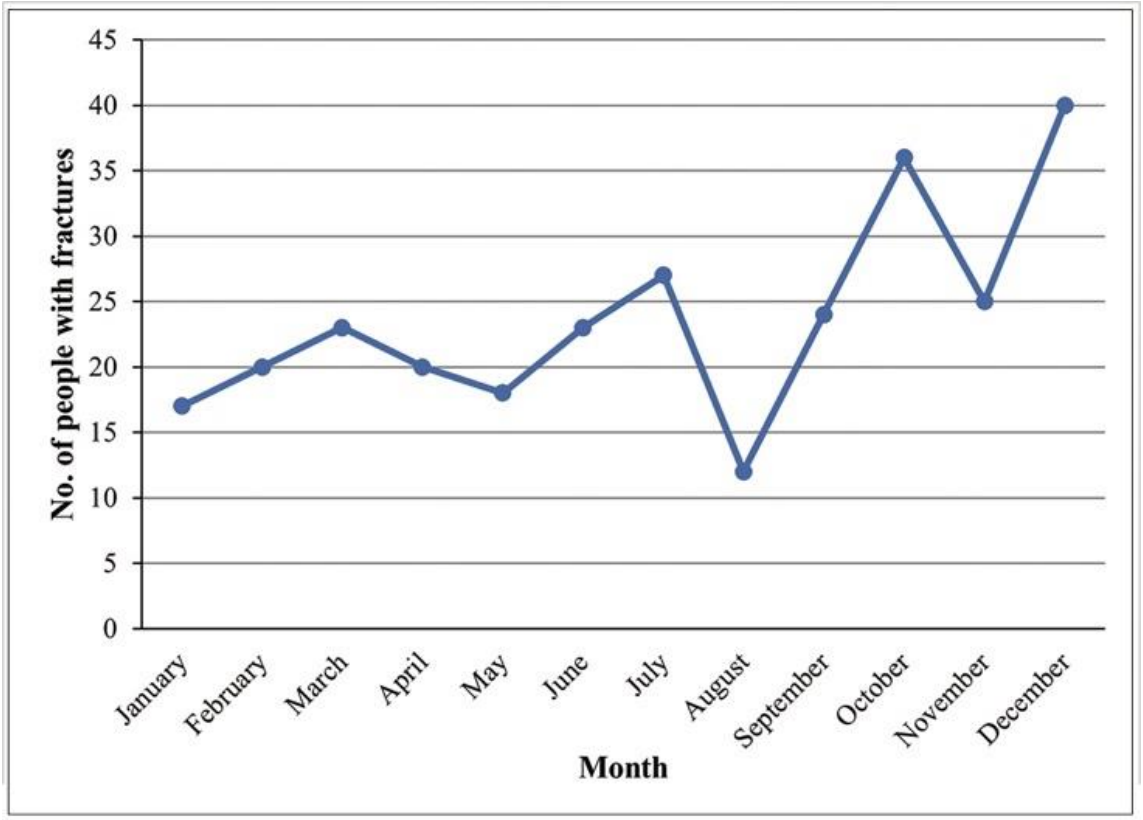

Figure 2 Incidence of intertrochanteric hip fractures by month.

The fractures were categorized as open or closed fractures. Among the 306 patients, only 1% (n=3/306) sustained open fractures, and 18% (n =55/306) of all fractures were attributed to high-energy trauma. Furthermore, our findings revealed that among the 22 patients under 40 years old, 68.2% (n=15/22) experienced high-energy trauma caused by motor vehicle accidents, leading to intertrochanteric fractures. Detailed patient epidemiology and mechanism of injury are shown in Table 1.

Table 1 Patient epidemiology and mechanism of injury.

	Number of fractures (n=306)
Mean age (±SD) % (*n*=)	69.9 (16.3)
Gender	
Female	51.6 (158/306)
Male	48.4 (148/306)
Race	
Malay	44.1 (135/306)
Malaysian Chinese	27.8 (85/306)
Malaysian Indian	26.8 (82/306)
Others	1.3 (4/306)
Injury location	
Accommodation	67.3 (206/306)
Road	16.7 (51/306)
Public area	6.9 (21/306)
Unspecified place	9.2 (28/306)
Injury mechanism	
Fall at same level	69.9 (214/306)
Motor vehicle accident	15.0 (46/306)
Fall from height	5.6 (17/306)
Unspecified fall	2.3 (7/306)
Other	7.2 (22/306)
High energy trauma	
Yes	18.0 (55/306)
No	70.6 (216/306)
Unknown	11.4 (35/306)
Type of fracture	
Open fracture	1 (3/306)
Closed fracture	99 (303/306)

Comorbidities and postoperative complications

Of the 306 patients documented, 78.8% (n =241/306) had comorbidities, while only 15.0% (n =46/306) had no comorbidities. There were 19 patients (6.2%) with unknown comorbid status. Most patients had hypertension (62.1%, n =190/306), while 42.6% (n =126/306) had diabetes mellitus. 26.1% (n =80/308) had dyslipidaemia and 11.1% (n =34/306) had ischaemic heart disease. 4.2% (n = 13/306) had renal complications, and 1.6% (n =5/306) had hepatic complications. Other comorbidities, such as asthma and atrial fibrillation, were classified as other complications, of which there were 42.5% (n =130/306) patients.

We examined the relationship between the presence of comorbidities and postoperative complications. The results showed that out of all the patients who had comorbidities and underwent surgical management (n =214), only 7.0% (n =15/214) developed early postoperative complications, and only 2.8% (n =6/214) developed late postoperative complications. And out of the 40 patients who did not have comorbidities and underwent surgery, none developed early or late postoperative complications.

Most patients underwent surgical repair within one week of admission (64.8%, n =160/247), 29.6% (n =73/247) were operated between week one and two of admission, while 5.6% (n =14/247) had operations later than two weeks from admission. The most common type of surgery was short PFN (36.6%, n =112/306), followed by DHS (23.2%, n =71/306) and long PFN (22.5%, n =69/306). 10.8% (n =33/306) underwent conservative management instead of surgery, while 6.9% (n =21/306) of the patients underwent other or unknown surgical measures.

The mean total hospital stays for all patients, whether they underwent surgical or conservative management, was 12.7 days. For patients with comorbidities, the mean total hospital stay was 12.3 days; for patients with no comorbidities, the total duration was 15.2 days. The frequency at which each type of management was done is described in Figure 3, and the type of implant used for each type of management is described in (Table 2).

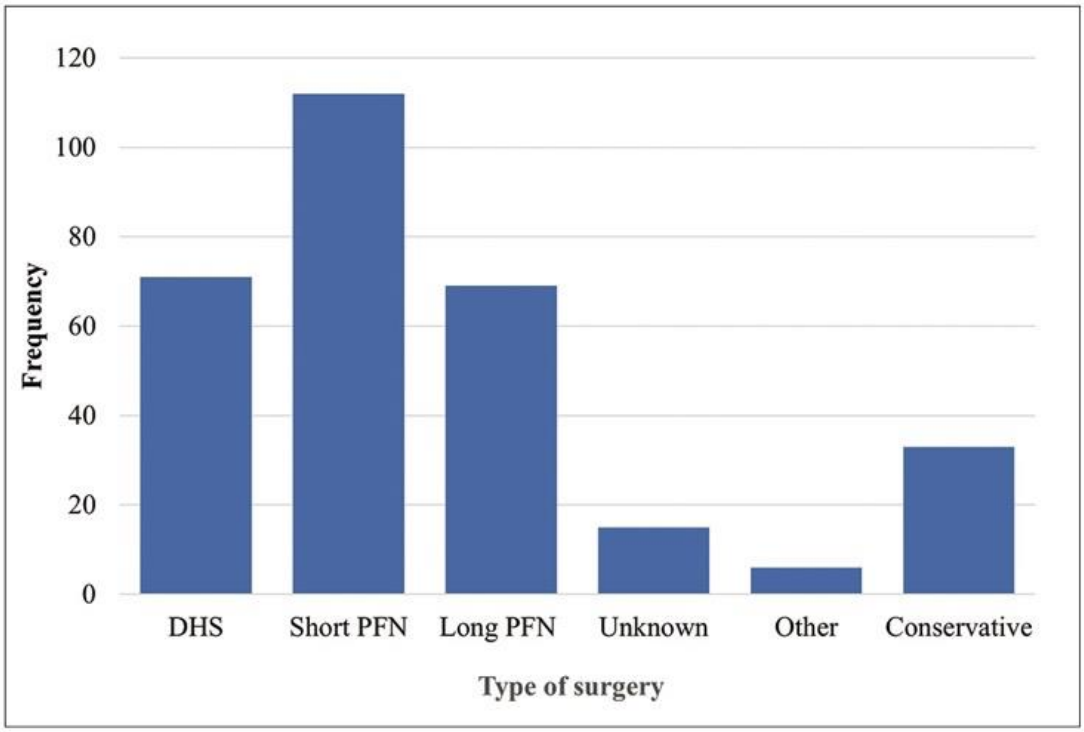

Figure 3 The frequency of different types of surgery done.

Table 2 Type of implant used in relation to type of surgery.

Brand of implant	Type of surgery						
	DHS	Short PFN	Long PFN	Unknown	Others	Conservative	Total
Unknown	8	8	8	15	1	33	73
Syntheses	0	40	26	0	1	0	67
Osteobionic	0	34	15	0	1	0	50
Minimed	0	12	6	0	0	0	18
Biomed	0	8	5	0	2	0	15
Isomedik	0	7	6	0	0	0	13
Smith and Nephew	0	1	3	0	0	0	4
Shiro	0	2	0	0	1	0	3
Hospital Implant	63	0	0	0	0	0	63

4. DISCUSSION

Intertrochanteric fractures impose a significant health burden, especially concerning the aging population. As the world's population ages, understanding the epidemiological characteristics and risk factors associated with these fractures becomes crucial for devising effective preventive measures and intervention strategies. In this retrospective descriptive epidemiological study of patients aged 18 and above who were scheduled to undergo surgical intervention for intertrochanteric fractures from January 2019 to December 2021, the patients were predominantly females (51.6%) with a relatively advanced mean age of 69.9 years. The primary cause of these fractures was falls at the same level (69.9%) at the patient's accommodation (67.3%).

In line with other studies of intertrochanteric fractures, our study showed that the majority of the fractures occur in the female population (Pillai et al., 2011; Mangram et al., 2014; Adeyemi et al., 2019; Tucker et al., 2017). This can be attributed to differences in bone density and bone structures between the sexes as well as increased susceptibility to osteoporosis, especially in the post-menopausal age group. Incidence is increased in the post-menopausal age due to lower estrogen levels, causing decreased bone formation and increased bone resorption.

Our findings showed an increased incidence of intertrochanteric fractures in older adults, with a mean age of 69.9. Multiple studies showed that the most significant number of fractures was seen in the 80 to 89 age group, while in our analysis, the highest number of fractures was seen in both the 70 to 79 and 80 to 89 age groups in a similar manner (Pillai et al., 2011; Mattisson et al., 2018; Adeyemi et al., 2019). Multiple studies show that most of the fractures in these age groups were seen in the female population (Mattisson et al., 2018; Isnoni et al., 2012; Tucker et al., 2017). There are multiple factors contributing to this finding which include increased risk for falls, and underlying comorbidities (Parkinson's, dementia, etc.) but age-related changes in bone density and structure rank the first to result in higher fracture rates in older adults (Cummings et al., 1985).

This can be linked to osteoporosis, increasing the susceptibility to fractures as the bone density will be reduced significantly (Cummings et al., 1985). Fractures can occur with minor trauma or a fall at the same level as the brittle bone cannot withstand impact forces. This is proven in our study as falls at the same level accounted for 69.9% of the fractures, and 67.3% occurred at the patient's accommodation, with the leading injury mechanism being low energy trauma (70.6%). The cause for 71% of intertrochanteric fractures that occurred in patients below the age of 40 in a study done by Hwang et al., (2001) were caused by high energy trauma. This is comparable to our study, where 68% (15/22) of patients under 40 years old who suffered intertrochanteric hip fractures were due to high-energy trauma sustained from motor vehicle-related accidents.

A 2020 study in Malaysia by Ong et al., (2020) revealed that 77% of patients who suffered hip fractures had at least one comorbidity, while 26% were considered multimorbid. Similarly, our study revealed that most patients (78.8%) had underlying comorbidities, with hypertension being the most common comorbidity (62.1%). Many other studies in other countries have also had similar findings, as these comorbidities contribute to factors that can ultimately increase the risk of falls and fractures (Lloyd et al., 2019). A 2021 study done in Malaysia that assessed the prevalence of falls in hypertensive elderly patients, mentioned that patients on diuretics or practice polypharmacy has a higher incidence of falls (Abu-Bakar et al., 2021). Patients with diabetes can develop peripheral neuropathy that compromises their lower limb sensation and balance which increases the risk of falls, which can lead to fractures (Lipsitz et al., 2018).

Chronic kidney disease can cause mineral and bone disorders leading to osteoporosis. Similarly, different comorbidities can increase fracture incidence in multiple ways (Riandini et al., 2020). Our study reveals that 9.8% of patients with comorbidities developed early or late postoperative complications. In contrast, no postoperative complications were seen in patients who underwent surgery and had no comorbidities. Roche et al., (2005) also described the increased risk of postoperative complications for patients who undergo surgical management for hip fractures and have comorbidities. A study by Ong et al., (2020) mentions that the hospital stay for patients who underwent surgical management for hip fractures ranged from 7-17 days. In our study, the mean hospital stay for patients who underwent surgery or conservative management was 12.7 days.

Study Limitations

Our sample size of 306 may not represent the larger population of patients who have suffered intertrochanteric fractures. With a small sample size, the diversity of comorbidities may also be limited. Due to this limitation, a follow-up study can be done with a larger sample size. This will result in a more significant data set for interpretation, thus providing a more precise understanding of the epidemiological findings. Of the 306 patients scheduled to undergo surgery for intertrochanteric fractures of the femur, only 84.3% (258/306) patients finally underwent surgery. The reason for patients not undergoing surgery was primarily due to the patients not being fit for surgery.

Hence, the outcomes of the surgery may not impact the patient positively. As our study is of a retrospective type, the documentation was incomplete in certain areas, follow-up data was not retrievable, and long-term patient progress could not be assessed. Difficulties were also faced in retrieving operative details of certain patient records due to technical system changes that took place at Hospital Tuanku Ja'afar Seremban from 2019 to 2022. The duration and extent of patient comorbidities were also not available in retrieved data which may have impacted our analysis of comorbidities and postoperative complications. Classification of fractures could also not be carried out as radiological findings could not be traced.

5. CONCLUSION

In conclusion, our study findings indicate that intertrochanteric fractures are most commonly seen in the older age group, with the highest incidence seen in the 70 to 79 and 80 to 89 age groups and the majority of patients being female. The most common injury mechanism was low-energy trauma at the patient's accommodation caused by same-level falls. The results obtained from this study are similar to the data published in other epidemiological studies of intertrochanteric fractures done in other countries. Special attention must be given to promote preventive measures, including early screening of comorbidities and fall prevention methods at home. Most patients below 40 years old suffered intertrochanteric femur fractures due to motor vehicle-related accidents. This issue must also be addressed by promoting road safety measures.

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Author's Contributions

All the authors made significant contributions to the development of study design, data collection, and analysis, interpretation of data, writing of the manuscript, and critically revising it for important intellectual content.

Ethical Approval

The study received ethical approval from the IMU Joint-Committee on Research & Ethics, International Medical University on 19 May 2022 (IRB reference number: 4.14/JCM-245/2022) and from the Medical Research & Ethics Committee, Ministry of Health Malaysia on 22 July 2022 (Ethical approval code: 22-01250-TTF).

Informed Consent

Not applicable.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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