

Health-Related Quality of Life in Patients with Bone Tumor around the Knee after Resection Arthrodesis

Wilasinee Sirichativapee¹, Weerachai Kosuwon¹, Winai Sirichativapee¹

Abstract

Background: This study aimed to compare the health-related quality of life (HRQoL) of patient with bone tumor around the knee after resection arthrodesis.

Methods: Patients between 15 and 70 years of age who underwent resection arthrodesis in Srinagarind Hospital >1 year were recruited. Patients were interviewed using a short form-36 questionnaire (social functioning-36 [SF-36] Ver2.0 Thai version) regarding their daily life problems.

Results: Eighteen patients with the mean age of 36.6 years (15–63 years) were included (15 females) in the study. Histological diagnoses were giant cell tumor 10 cases, osteosarcoma seven cases, and low-grade chondrosarcoma one case. Site of lesions was distal femur 15 cases and proximal tibia 3 cases. According to HRQoL, patients have good quality of life (score SF-36 >70) in all domains: Mean score: Physical functioning 75.55 ± 21.88, role physical 71.18 ± 22.70, bodily pain 85.41 ± 22.51, vitality 77.43 ± 16.76, general health 74.44 ± 19.16, SF 83.05 ± 26.40, role emotional 80.09 ± 22.89, and mental health 77.77 ± 21.29. Complications post-operative are broken implants (3 cases, 16.7%) and infections (4 cases, 22.2%).

Conclusion: In patients with bone tumor around the knee after resection, arthrodesis has a good quality of life in all domains in SF-36 version 2.0 questionnaire including function, pain, and mentality.

Keywords: Limb salvage, Arthrodesis, Quality of life, social functioning-36 version 2.0, Osteosarcoma, Giant cell tumor.

Introduction

The knee is a common site for bone tumors, primary malignant and aggressive benign bone tumors, whether clinically painful or not. The most common aggressive benign bone tumor is giant cell tumor (GCT) (the second most common of benign bone tumor) [23] and the most common primary malignant bone tumor is osteosarcoma [4]. Treatments of malignant and aggressive bone tumor in adult have significant advancement. As a result of advances management including neoadjuvant chemotherapy, surgical technique, radiation, and survival rates improved considerably. Surgery offers local control of tumor while chemotherapy provides a general control of disease (micrometastasis) [1, 2]. The

interesting in limb salvage has increased significantly because it is an attractive procedure to amputation [3]. The increasing number of limb salvage procedure is significant the importance to assess health-related quality of life (HRQoL) in this patient.

Wide resection of tumor results in loss of bone, muscle, even, entire the joints. Reconstruction of bone defect following wide resection of malignant or aggressive benign bone tumors around the knee is a critical problem in orthopedic surgery. Several options are available for reconstruction such as endoprosthesis, allograft-prosthesis composite (APC), and even arthrodesis [24]. It is difficult to choose the best treatment for each

particular patient due to several factors such as site, pathology, life expectancy, predicted function of limb, patient's demand, expectation, and economy [27].

An ideal bone and joint reconstructions should be durability in weight-bearing lower extremities. Several previous studies are comparing HRQoL between limb salvage and amputation [5, 6, 7, 9], but no study is focusing in HRQoL of patients who underwent arthrodesis. The purpose of this study was to access the HRQoL in patients following knee resection arthrodesis. We also examine the complications and daily life problem in this patient population.

Patients and Methods

Patients: A retrospective review was made of

18 patients with various primary malignant and aggressive benign bone tumors around the knee who underwent limb salvage surgery

¹Department of Orthopaedics, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand.

Address of Correspondence

Dr. Winai Sirichativapee,
Department of Orthopaedics, Srinagarind Hospital, 123 Khon Kaen University, Nai Mueang Sub-District, Mueang District, Khon Kaen Province - 40002, Thailand.
E-mail: winaisiri@yahoo.com



Dr. Wilasinee
Sirichativapee



Dr. Weerachai
Kosuwon



Dr. Winai
Sirichativapee

© 2019 by Journal of Bone and Soft Tissue Tumors | Available on www.jbstjournal.com | doi:10.13107/jbst.2454-5473.412

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

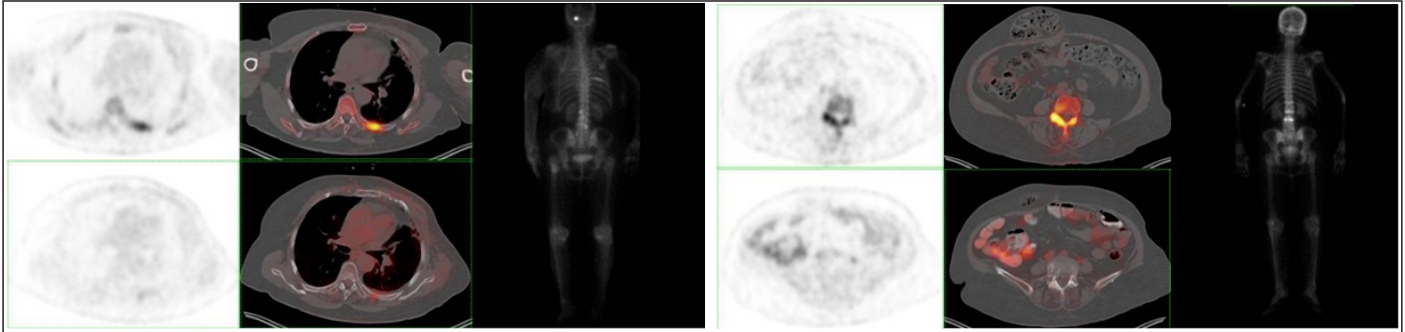


Figure 1: The patient with diagnosis of breast carcinoma, the severity of metastatic involvement is significantly different in the and sodium fluoride (NaF) positron emission tomography/computed tomography (PET/CT) NaF PET/CT compared to bone and fluorodeoxyglucose FDG PET/CT imaging and the follow-up NaF study showed significant progression.

Figure 2: The patient with mild fluorodeoxyglucose (FDG) accumulation in the L3 vertebra with significant metastasis in the sodium fluoride (NaF) positron emission tomography/computed tomography (PET/CT) compared to the bone scintigraphy with endometrium carcinoma.

and reconstruction with arthrodesis in Srinagarind Hospital. There are 300–350 patients with bone and soft tissue tumor every year in Srinagarind Hospital. Between 2004 and 2014, there were 30 patients who undergo knee resection arthrodesis. Patients were eligible if they were aged between 15 and 70 years. The time since surgery was >12 months. The malignant and aggressive benign bone tumors were located at distal femur or proximal tibia and the surgical intervention consisted of arthrodesis. All patients must understand the Thai language and the questionnaire and also medical records of patients must have pathological reports, surgical technique, and follow-up data. Patients were not included if they cannot be contacted.

This study was carried out according to the Declaration of Helsinki and the Khon Kaen University Ethics Committee for Human Research approved the study protocol (HE591218).

Surgical technique: After wide resection of the tumor, arthrodesis of knee was performed in various ways. Arthrodeses were fixed by intramedullary nail or plate fixation. Bone reconstruction consisted of autologous bone graft (femoral turn down or tibial turn up combined with fibular strut graft) or allograft (Fig. 1).

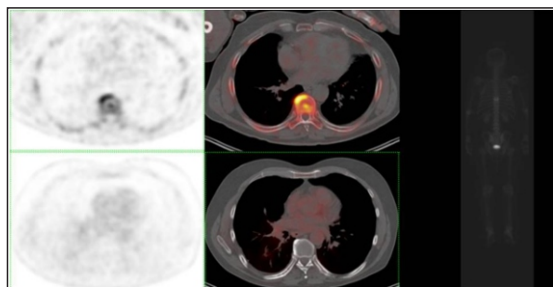


Figure 3: The patient with stable metastatic lung carcinoma in the T8-9 vertebral region with mild fluorodeoxyglucose (FDG) uptake but significant activity accumulation in the sclerotic lesion in sodium fluoride positron emission tomography/computed tomography (NaF PET/CT) images.

Patient assessment: All patients had clinical assessment consisted partly of questionnaire and partly of interview. All patients were interviewed using Thai short form-36 version 2.0 when they came follow-up at orthopaedic clinic in Srinagarind Hospital. Thai social functioning-36 (SF-36) version 2.0 has been validated [14], self-administered measure evaluating eight domains: Physical functioning (PF), physical role limitation, bodily pain, general health (GH), vitality, SF, emotional role, and. SF-36 consisted of 36 questions, each domain scale from 0 (worst health status) to 100 (best health status). Score >70 indicates good quality of life when compare to normal population. Thai SF-36 version 2.0 was found to be sufficient for research purposes, with Cronbach's alpha ranging from 0.72 to 0.94.

The patient interview aimed to evaluate which consequences of the surgery interfered their quality of life and complication from surgery.

Statistical analysis: All analyses were performed using SPSS version 19. Descriptive statistics included calculation of frequencies and percentage for demographic data and surgical technique. Mean and standard deviation used for clinical variable.

<H1>Results

<H2>Patients characteristics

The study population consisted of 18 patients 15–67 years of age with mean age of 36.61 years (standard deviation 16.31): 83.33% of patients were women. The diagnosis is GCT (55.6%), osteosarcoma (38.9%), and low-grade chondrosarcoma (5.6%). Site of lesion is distal femur (83.3%) and proximal tibia (16.7%). Number of previous

surgeries were 3 (5.6%), 2 times (16.7%), and single operation (77.8%) (Table 1).

Quality of life assessment: Table 2 shows scores from SF-36 version 2.0 in each patient. Most of the patients have good quality of life in SF domain (score >70, 83.33%). More than two-third of patients have scored >70 in PF domain. However, almost half of patients show limitation in physical role domain (38.88%).

From Chart 1, means score of the study population shows scores >70 in all domains of SF-36 version 2.0 indicate that the study populations have good quality of life after resection arthrodesis. All patients who entered the study completed all the questionnaires. The patients consistently reported high quality of life on all domains of SF-36 version 2.0. Daily life problems were unable to work and unable to bend the knee.

Complications: The complications from surgery consisted of broken implant (16.7%) and infection (22.2%). According to infection, 60% are found in patients who underwent allograft reconstruction. All patients were cured from infection, average time was 23 months. Organism of infections was Klebsiella pneumonia and Staphylococcus coagulase positive.

Discussion

Limb salvage procedure has replaced amputation as the treatment of primary bone tumor around knee. Limb salvage provides advantage in function, appearance and is considered to be cost-effective when compared with amputation. Arthrodesis is a choice of reconstruction after wide resection tumor that can provide more durable stability [22].

This study aimed to investigate HRQoL in patients who have primary malignant or

Diagnosis	Bone scintigraph	NaF	FDG
Over	2	0	3
Breast 1	5	0	10
Breast 2	0	1	5
Non-Hodgkin lymphoma	7	0	4
Lung	4	3	10
Stomach	4	1	10
Uterus sarcoma	2	2	2
Breast 3	4	2	10
Merkel cell carcinoma	1	0	1
Endometrium	4	1	5
Lung	2	0	2

FDG: Fluorodeoxyglucose, NaF: Sodium fluoride

aggressive benign bone tumor around the knee who underwent knee resection arthrodesis. According to HRQoL measures, patients reported significantly better score of SF-36 in all domains, physical and mental. Complications from surgery are infection and broken implant. According to infection, we found that patients who underwent allograft reconstruction have infected allograft (60%). However, all patients were cured and no one turns to amputation. Several studies have highlighted problem of infection after limb salvage, in which it is frequent as after using allograft [29, 30]. Apart from complications of surgery, patients reported their daily life function almost same as before surgery. According to our study, knee arthrodesis did not decrease the quality of life in the patients. In malignant or benign bone tumors, there are several treatment methods instead of arthrodesis and each technique has several advantages and disadvantages. The original arthrodesis using large segmental bone graft to retain length was first reported by Putti

and Juvara. It was later modified by Campanacci and Costa [28]. The advantages of arthrodesis are limb salvage surgery and patients also have leg for walking or working. On the other hand, the important disadvantage is limit motion of knee so it makes problem when patient using public transportation like bus. About preserving joint motion surgery, there are many choices such as endoprosthesis or APC. Endoprosthetic replacement from the previous study has many advantages such as early stability, early weight-bearing, motion of knee, functional outcome good to excellent, and cosmetic, but aseptic

loosening, local recurrence, mechanical failure, fracture, and infection are disadvantages of this method that may limit the long-term survival of prosthesis and lead to risk of revision [24, 25]. Reconstruction with the use of autologous graft and allograft also has several advantages and disadvantages to consider before chosen. Related to autologous bone graft, advantage is union rate and decreasing risk of transmitted disease, but limitation of this method is the limitation of bone stock after wide resection [4]. However, for allograft, it can fill any size of bone defect because bone bank also has many size of bone, but patient has to deal with risk of delayed union, non-union, and also infection. Hence, there is not the best reconstruction method for every patient, but we have to consider the most suitable method for each patient. Previous studies did report improvement in quality of life after bone tumor surgery, which include limb salvage and ablative [11]. This study explored quality of life in patient who has bone tumor around the

knee who aged 8–25 years. The study revealed significant worse score in quality of life in function domains of SF-36, specifically significantly lower scores in PF, role physical, GH and mental component. These results are similar with several studies earlier among patients with malignant of the leg that demonstrated lower HRQoL score in PF. However, from the previous several studies, they studied in general of limb salvage, prosthesis and arthrodesis, and amputation but no study which focuses just in the individual procedure. Our study is the first study to present the quality of life in patients who underwent resection arthrodesis that has higher scores when compared to healthy population. Our study, however, has limitation in the study design that was cross-sectional study so there are some differences in surgical procedure of arthrodesis, and in size of population was relatively small.

Conclusion

It is suggested that arthrodesis is a good treatment of choice for reconstruction after wide resection bone tumor around the knee. Score of SF-36 shows good quality of life in all domains including physical status and mental status.

Conclusions

NaF PET/CT fulfills our expectations in the detections of bone metastasis compared to the bone scintigraphy and FDG PET/CT. However, NaF PET/CT cannot be a first-line imaging modality due to high costs but might be indicated, especially in the sclerotic hypometabolic bone lesions.

References

- Tarnawska-Pierścińska M, Hołody Ł, Braziewicz J, Królicki L. Bone metastases diagnosis possibilities in studies with the use of 18F-NaF and 18F-FDG. *Nucl Med Rev Cent East Eur* 2011;14:105-8.
- Sampath SC, Sampath SC, Mosci C, Lutz AM, Willmann JK, Mitra ES, et al. Detection of osseous metastasis by 18F-NaF/18F-FDG PET/CT versus CT alone. *Clin Nucl Med* 2015;40:e173-7.
- Harisankar CN, Agrawal K, Bhattacharya A, Mittal BR. F-18 fluorodeoxy-glucose and F-18 sodium fluoride cocktail PET/CT scan in patients with breast cancer having equivocal bone SPECT/CT. *Indian J Nucl Med* 2014;29:81-6.
- Roop MJ, Singh B, Singh H, Watts A, Kohli PS, Mittal BR, et al. Incremental value of cocktail 18F-FDG and 18F-NaF PET/CT over 18F-FDG PET/CT alone for characterization of skeletal metastases in breast cancer. *Clin Nucl Med* 2017;42:335-40.
- Chan HP, Hu C, Yu CC, Huang TC, Peng NJ. Added value of using a cocktail of F-18 sodium fluoride and F-18 fluorodeoxyglucose in positron emission tomography/computed tomography for detecting bony metastasis: A case report. *Medicine (Baltimore)* 2015;94:e687.
- Igaru A, Mitra E, Mosci C, Dick DW, Sathegke M, Prakash V, et al. Combined 18F-fluoride and 18F-FDG PET/CT scanning for evaluation of malignancy: Results of an international multicenter trial. *J Nucl Med*

2013;54:176-83.

7. Gradishar WJ, Anderson BO, Balassanian R, Blair SL, Burstein HJ, Cyr A, et al. NCCN Clinical Practice Guidelines in Oncology Breast Cancer Version 2; 2016. Available from: https://www.nccn.org/professionals/physician_gls/pdf/breast.pdf. [Last accessed on 2016 Oct 19].

8. Yoon SH, Kim KS, Kang SY, Song HS, Jo KS, Choi BH, et al. Usefulness of (18)F-fluoride PET/CT in breast cancer patients with osteosclerotic bone metastases. *Nucl Med Mol Imaging* 2013;47:27-35.

9. Israel O, Goldberg A, Nachtigal A, Militianu D, Bar-Shalom R, Keidar Z, et al. FDG-PET and CT patterns of bone metastases and their relationship to previously administered anti-cancer therapy. *Eur J Nucl Med Mol Imaging* 2006;33:1280-4.

10. Lapa P, Saraiva T, Silva R, Marques M, Costa G, Lima JP. Superiority of 18F-Fna PET/CT for detecting bone metastases in comparison with other diagnostic imaging modalities. *Acta Med Port* 2017;30:53-60.

11. Araz M, Aras G, Küçük ÖN. The role of 18F-NaF PET/CT in metastatic bone disease. *J Bone Oncol* 2015;4:92-7.

12. Schirrmester H, Glatting G, Hetzel J, Nüssle K, Arslanemir C, Buck AK. Prospective evaluation of the clinical value of planar bone scans, SPECT, and (18)F-labeled NaF PET in newly diagnosed lung cancer. *J Nucl Med* 2001;42:1800-4.

13. Piccardo A, Puntoni M, Morbelli S, Massollo M, Bongioanni F, Paparo F, et al. 18F-FDG PET/CT is a prognostic biomarker in patients affected by bone metastases from breast cancer in comparison with 18F-naF PET/CT. *Nuklearmedizin* 2015;54:163-72.

14. Igaru A, Young P, Mitra E, Dick DW, Herfkens R, Gambhir SS. Pilot prospective evaluation of 99mTc-MDP scintigraphy, 18F NaF PET/CT, 18F FDG PET/CT and whole-body MRI for detection of skeletal metastases. *Clin Nucl Med* 2013;38:e290-6.

15. Hillner BE, Siegel BA, Hanna L, Duan F, Quinn B, Shields AF. 18F-fluoride PET used for treatment monitoring of systemic cancer therapy: Results from the national oncologic PET registry. *J Nucl Med* 2015;56:222-8.

16. Igaru A, Mitra E, Dick DW, Gambhir SS. Prospective evaluation of (99m)Tc MDP scintigraphy, (18)F NaF PET/CT, and (18)F FDG PET/CT for detection of skeletal metastases. *Mol Imaging Biol* 2012;14:252-9.

Conflict of Interest: NIL

Source of Support: NIL

How to Cite this Article

Koç Z P, Kara P Ö, Sezer E, Erçolak V. Diagnostic Comparison of F-18 Sodium Fluoride NaF, Bone Scintigraphy, and F-18 Fluorodeoxyglucose Positron Emission Tomography/Computed Tomography in the Detection of Bone Metastasis. *Journal of Bone and Soft Tissue Tumors* Jan-Apr 2019;5(1): 17-20.