THE DIAGNOSTIC VALUE OF CLINICAL, RADIOLOGICAL AND BONE SCINTIGRAPHY INVESTIGATION WITH 99mTc-MPD USED IN EARLY PERIOD OF THE FINGER FELON

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The aim of the study was an assessment of the early stage of felon – non exceeded 72 hours from the first symptoms – with 99mTc-MPD (metylendiphosphonien marked by Technetium) in relation to patient physical investigation and radiological hand investigation.

Material and methods. 72 patients with the one finger felon were classified to the research. All patients were on the base of clinical investigations classified to the surgical intervention. Then they were divided on to two groups: one (A) where decision about final treatment method was based on 99mTc-MPD result. In the group X-ray was made also. The B group where the recognition verifying investigation was hand X-ray picture.

Results. of investigations. In the A group on the basis of 99mTc-MPD to the surgical incision only 11 from 30 patients (36%) were classified. A pathological content was affirmed in 26% (at 8 patients). However in group B on the basis of X–ray examination only 5 patients (11%) from 42 were classify to surgical finger incision. Furthermore pathological content was affirmed in 14 patients (33%) after incision.

Conclusion. In the early stage of finger felon the 99mTc-MPD investigation could be useful for verifying treatment method only.

Key words: the bone scintigraphy, 99mTc-MPD scintigraphy, finger felon, finger treatment

Bacterial hand infections (b.h.i.) occur mainly among blue-collar workers, especially in young rural communities (1-5). Therefore the greatest number of b.h.i. occurs in summer and autumn when physical works are most intensive. High increase risk of the disease in those groups results from violation of personal hygiene practices and work safety rules (3, 4, 6). Climatic factors in the period have an essential influence on the development of pathological bacterial flora as well.

Felon (panaritium) is the purulent bacterial infection of hand surface of a finger, mostly evoked by Staphylococcus aureus or seldom by mixed bacterial flora (7, 8). The virus figure of felon also exists, it is called the aseptic felon and was diagnosed in 1909 by Adamson and is a result of Herpes Simplex Virus type 1 or type 2 infection. It does not require an operating treatment but during several days it undergoes self-treatment.

One of the most frequent pathogen of bacterial felon is Staphylococcus aureus - Gram positive, oxygenic group (2, 9, 10, 11). In the 80-ies Staphylococcus aureus was responsible for finger felon mostly, but presently more and more felon is a result of mixed bacterial flora contagion (3, 10, 12).

Presently felons with gram negative bacterial flora are also observed. The most frequent cause of bacterial felon are petty finger wounds and finger excoriations formed due to physical
work or skins excising. The other causes of felon are finger bruises without breaking of skin coats and complication of open finger wounds. The course of felon is very treacherous and dangerous because symptomatic felon appears after 3-4 days since the moment of injury. Therefore, in the first period of disease, if there are no pyogenic changes in finger tissue and periostitis features do not exist, there is a possibility of quick and effective non-operative treatment.

So far with regard on diagnostic difficulties caused by lack of objective method, verifying the diagnosis the most important meaning in felon diagnosis and treatment was subjective and objective investigation of the patient. The most popular - radiological method applied for finger felon examination is very limited because according to textbooks and literature, the first inflammatory bone changes are visible in radiograms after a week or two from the beginning of disease, sometimes even after 3-4 weeks. However, in bone scintygraphy with ⁹⁹ᵐTc-MPD (metylendiphosphonien marked by Technet) inflammatory features appeared in the first day of disease what could be useful for precision degree assessment (13-16).

In Polish medical literature felon is divided in coetaneous, sub-coetaneous, tendon felon, osseous felon and joint felon. Distinction of the above mentioned figures of felon in clinical practice is very difficult, sometimes even impossible, because the anatomical building of the finger facilitates spreads the inflammable presses dip to the finger phalanx. Therefore the development of disease can quickly bring destruction of the deep structures of the finger and can be a cause of durable finger disability because of the finger stiffness, its synovial sheath necrosis or bone necrosis as well (17, 18). That is why differentiation of the felon figure is the basic and urgent thing, an exclusion of its osseous, tendon or joint figure. Development of the mentioned felon figures (in English-speaking literature called the “deep” felon) can be a reason of finger or its phalanges amputation necessity (6). Almost always the side effect of the “deep” felon is handicaps of the finger functions what makes durable inability to the skilled work making especially in young age patients. That is why the presence of bone or joint contagion needs urgent surgical intervention to prevent unfavorable sequent consequences. The bone scintygraphy with ⁹⁹ᵐTc-MPD is commonly considered as a very sensitive method for the recognition and assessment of the felon figure already in the first day of bone contagion (15, 16).

We should turn the attention that felon in distinction from the majority of inflammable hand finger illnesses characterize lack of all local inflammable state features, what could be the essential difficulty of the quick felon recognition. Unfortunately not always, what is commonly consider, the osseous felon is the after-effect of soft finger tissues suppuration, therefore the course of contagion can be concealed and quick, almost never such symptoms like finger reddening and its excessive warming up are present which are perceived by patient and doctor easily (8, 18).

Complications after operating treatment of the finger felon and frequently happened blood material (non-suppurate) after incision in the early period of the felon, was the reason why we made attempt of conservative treatment in early period of the felon, not exceeding 72 hour from beginning of the disease. Lack of suppuration in soft tissues of the finger and lack of periostitis in scintygraphy was the condition of conservative treatment initiating. In the work, we tried to compare diagnostic effectiveness of radiological and scintygraphy investigation of a hand in the early period of the finger felon.

MATERIAL AND METHODS

For the investigations in the early stage of felon with utilization of radiological and scintygraphy methods, we were given the assent of the Committee of Bioethical Silesian Medical University on 11th December, 2001.

To the investigations we classified 72 patients with one finger felon out of 112 ills admitted to the surgical outpatients department of District Hospital in Prudnik from 25th June 2001 to 30th April 2003. To the investigations we classified patients with felon below 72 hours from the beginning of disease. Remaining 40 patients were not classified to the investigations, because the early period of disease exceeded 72 hours among 23 of them, it means from the appearance of the first symptoms of felon such as: pain, swelling of a finger, limitation of movability. Moreover, 17 patients were not classified, because in the track of disease they did not answer appointed visits or did not apply proposed treatment recommendations.
All patients belonged to administrative district of Prudnik town, comprises three towns: Prudnik, Głogówek and Biała as well as 101 villages. Patients’ age ranged from 15 to 78, the average 33 ± 3 years, among patients with felon of finger there were 53 men and 19 women, all men’s average age ranged 31 ± 3 years, women 40 ± 12. In the group of 72 patients 57 did physical work, 11 intellectual work, and the remaining four were young men under 18 years old doing physical work connected with school practice. Among 72 patients 53 lived in the country and 19 in a town, among 72 patients only 30 were made bone scintigraphy. In this way we received two groups: the A group - treated in dependence of result of scintigraphy and group B - treated operatively. Certainly all patients had been investigated by a surgeon before they were classified to the group and at each case the felon diagnosis was confirmed on basis of subjective and objective symptoms.

Group A – 30 patients, 22 men and 8 women. The men’s age in this group ranged from 19 to 67, and women from 22 to 70. The average men’s age in this group was 33 ± 2, women 38 ± 3 years. At patients of group A in the day of admission to surgical outpatients department and after felon recognition, following investigations were executed:

1. X-ray picture of finger, in two projections (dorso - palmary and radio-ulnar position).
2. Three-phase scintigraphy of bone with 99mTc-MPD use. The bone scintigraphy was executed in 17 cases in the day of admission to surgical outpatients department and at 13 cases next day because Isotope Department working hours made earlier execution impossible.

Group B – 42 patients, 31 men and 11 women, men’s age in this group ranged from 15 to 71 years and women between 19 and 78 years. The average men’s age in this group was 30 ± 2 years, women 41 ± 3 years. This group consisted of patients, who were introduced hand X-ray picture in dorso - palmar and radio-ulnar projection in the day of admission to surgical outpatient department with suspicion of finger felon and after preliminary clinical diagnosis felon was confirmed, so incision and drainage of the wound were applied.

Both groups of patients in the day of admission to surgical outpatient department received orally wide specter antibiotic from semi synthetic penicyllin group 1875 mg per 24 hour in three doses divided. Every operating patient was examined in District Epidemiological Station in Prudnik. Free of pathological flora results were received after 24 hours, the time of expectation of pathological flora results lasted from 3 to 6 days. The period of antibiotic therapy lasted from 4 to 17 days, the average 10 days. Every patient had antibrachial plaster rail hanged on a sling in physiological, resting hand position (wrist straighten since 30 to 50 degrees, metacarpal flexion between 50 to 90 degrees and interphalangeal flexion between 10 to 20 degrees). The period of plaster rail using was from 3 to 12 days. The hand was elevated above the elbow level to avoid blood and exudation stagnation in a hand.

The radiological picture of the finger was made once in the group A and B by X-ray machine type XD 18 use in Prudnik District Hospital (the Manager of Radiology Department, I. Pajor). Directly after X-ray investigation, the result was estimated and described by a radiologist. The average used dose to make one projection of the picture was 150 mA, exposure time 0.04 s, voltage 42 kV. The scintigraphy investigation was made once in Department of Nuclear Medicine in Opole (The Manager of Department, L. Godula).

The investigation was executed by Gamma camera MB 9200, apparatus Spect Gamma Camera Orbiter 2LC 35 Siemens. To illustrate it gamma camera with collimator hole-parallel (the symmetrical parts of body) was used. The average dose of ionizing radiation during scintigraphy with use 99mTc-MPD was 700 MBq, the exposition to radiations ranged from 2 to 10 mSv (the effective dose equivalent was 6.0 mSv). The results of scintigraphy investigation were subjected to a radiologist and consulting with a surgeon. Decisions about operating or not operating treatment were undertaken when enlarged capture of gauge appeared in all winding phases of investigation.

RESULTS

It group A – treated depending of bone scintigraphy result, among 30 persons, after scintigraphy investigation there were 11 patients with felon applied to the operating treatment, in 19 cases the effective non-operative treatment was applied.

Group B – all patients were treated operatively.
In group A the treatment period among non-operative treated patients lasted from 8 to 20 days, the average 16 days. However, at patients from group A, where operating treatment was applied, this period lasted from 17 to 31 days, the average 25 days. In group B (all patients were treated operatively) the treatment period lasted from 15 to 32 days, the average 26 days.

In group A the bone scintigraphy was a verifying method of treatment factor. In this group all patients were classified to operating treatment on basis of clinical investigation and anamnesis. However, on basis of executed X-ray examination no one was classified to operating treatment because of lack of inflammation process. In group B on basis of the clinical investigation and anamnesis all patients were classified to operating treatment; however, on basis of executed X-ray examination only 5 patients were classified to surgical treatment. At the remaining 37 patients there were not any inflammation features in X-ray examination of the hand affirmed. In both patients’ groups results of qualification to operating treatment were compared with results of finger incision.

In group B, where bone scintigraphy was not applied, in 67% cases after incision rare non-includes pathological bacterial flora material responsible for felon occurrence was received. In group A, where scintigraphy was verifying diagnosis method, in 10% cases the rare material as the cause of felon was confirmed.

On fig. 1 and 2 we showed applied diagnostic methods effectiveness for both studied groups of patients with felon. The measure of incorrect qualification to operating treatment in both groups was the number of cases with rare (blood) material received after incision. On fig. 3, 4, 5 and 6 examples of scintigraphy and radiology pictures with felon were introduced. On fig. 3 and 4 treated non-operatively, on fig. 5 and 6 treated operatively.

**DISCUSSION**

Bacterial hand infection in an outpatient department has at present gentler course than years ago, what is caused by easy access to a doctor especially a family doctor, but also by larger patients consciousness relating to prophylaxis of this illness as well as easier access to modern antiseptic centers and an-
tibiotics, which has the essential influence on limitation of disease development (19, 20, 21). Therefore, gentle course of this illness makes possible use of non-operative treatment and it contributes to shortening of the time of disease duration. Such way of treatment is profitable for a patient, his employer, and even insurer, because except shortened time of disease it reduces the cost of treatment which is an essential economic aspect at present (22, 23).

In majority of Polish and world publications bacterial hand infections and among them the felon are considered under many aspects such as the ethiopathology, epidemiology, statistical occurrence, more seldom complications (2, 10, 11, 24, 25). Unfortunately, few publications take into account the opportunity of non-operative felon treatment (26). It should be noticed that every hand contagion in initial period of disease runs without presence of pus so there is the possibility of use non-operative treatment in its early period, which is always better way of treatment for a patient. Non-operative treatment permits to avoid painful scars after incisions and as a result the potential disorders of sense and instability of finger after incision (fig. 7) as well as a total period

Fig. 4. The bone scintigraphy investigation of hand with the MPD gauge
Investigation comment: Enlarged blood supply (vascular phase) and accumulating MPD gauge in tissue phase in middle finger III left hand. The enlarged escapement of gauge in osseous phase does not affirmed in this finger the MPD
Conclusions: Inflammatory process in right hand of left middle finger III concerns on soft tissues only

Fig. 5. X-ray picture of felon of median finger right hand
Comment: Radiological description shows bone periostitis of median finger of right hand

Fig. 6. The bone scintigraphy investigation of hand with the MPD gauge
Investigation comment: In osseous phase the intensive escapement of gauge in the distal phalange of right hand middle finger III. In tissue phase asymmetry accumulating of gauge in metacarpi and wrists - the congestive of soft tissues on right side as well as the small asymmetry in osseous phase
Conclusions: The scintigraphy examination suggests both the inflammatory process in the soft tissues and in the bone of right hand middle finger III. Reactive congestive of metacarpus and wrist
of treatment and rehabilitation shorten. Not large swelling of the palm surface of a finger is caused by tight arrangement of internal structures and small extensibility of this surface. We should turn the attention that felon course characterize lack of all local inflammable state features what is the essential difficulty of the good felon recognition proper treatment. So in chirurgical references is established saying that one not-slept night advocate chirurgical intervention. Therefore, the swelling moves from palm surface of finger to dorsal side. Such course of disease favors the oversight of the felon. Therefore, in the initial period of disease it is necessary to use very exact investigations to get a certain answer to the question how far felon is advanced and whether it is possible to introduce non-operative treatment? The bone scintigraphy has been considerate as the most sensitive investigation for periostitis assessment. A radiological method of diagnosis is clearly limited in this case. First of all, according to experts in the field of radiology, first inflammatory bone changes are displayed on X-ray methods after about 7 days since the beginning of the disease. Secondly, in 50% cases sharp or sub-acute bone inflammation does not display any pathological features in X-ray investigation (13, 15, 16). It also seems that in case of felon more significant for identification may be patient’s clinical investigation and in the same time the surgeon’s professional experience (8, 18). The evidence can be print 2, which proved, that at 14 existing felons among 42 patients, only five cases were diagnosed with the X-ray examination method. However, print 1 showed, that at 8 really existing felons in group of 30 patients, the X-ray examination did not show their existence at all, although, the bone scintigraphy showed it in 11 cases. At two ills in this group, falsely positive result can be the proof of very high sensitivity of the scintigraphy investigation. It should be indicated that there is no contraindication to apply the scintigraphy of osseous system; moreover, it does not require preparing the patient to investigations, which is an unquestionable benefit. The other important advantage of scintigraphy are forms of investigation results, which gives us the possibility of insight into next phases of investigation and assessment of every phase separately. It is a very sensitive investigation. Although it is not specific, in the case of felon, it should be considered that scintigraphy is a verifying diagnosis method not a sifting investigation. Comparing both diagnostic methods in studied patients groups A and B, we can affirm completely opposite situations. In group A, in which scintigraphy was applied as verifying diagnosis method, the larger number of positive results than in reality was received. In-group B the radiological investigation of hand revealed osseous felon at five patients only and it really existed at 14 patients. Obviously easy access and low price of the radiological investigation in certain way can excuse an attempt of the felon verification by X-ray pictures. However as show this material you should remember that the radiological investigation will make difficulties in proper felon recognition in the situation of diagnostic doubts rather. And if such possibility exist you should rather use the scintigraphy investigation.

CONCLUSIONS

1. Subjective and objective patient’s investigation has essential value for felon recognition; however, without additional investigations the decision about non-operative way of treatment is risky because of lack of all inflammatory factors.
2. Radiological investigation is not useful in the early stage of finger felon because of lack of pathological changes in X-ray pictures.
3. Bone scintigraphy investigation with 99mTc MPD is very sensitive and proficient for the early period of felon diagnosis. Three-phase course of investigation makes exact abilities of all finger structures assessment.
REFERENCES


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