Telemedical examination of a patient with knee disorders

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Abstract
Since the appearance of coronavirus disease (COVID-19), there has been a tendency that orthopedic patients and their doctors seek new ways of communication. If a patient suffers from an acute knee pain, it is of vital importance that a clinical examination is performed as a part of diagnostics, during which the most important data is obtained by the palpation of anatomic structures and the performance of various focused tests of the knee joint motion (provocative signs). Such examinations are, however, limited due to the current restraints in social interaction and the reduction in elective medical treatments. The purpose of this article is to present the telemedical examination of a patient with a knee joint dysfunction – to describe the procedures, and to present what we can find out at such examination. In the conclusion the advantages and disadvantages of such examinations are also discussed. Key words: telemedicine, telerehabilitation, orthopedic patients, exercise, physiotheraphy

Telemedicinska obravnava pacienta z motnjami v kolenskem sklepu

Povzetek
S pojavom koronavirusne bolezni COVID-19, se je tako kot pri mnogih drugih panogah, tudi pri ortopedskih pacientih pojavila težnja po novih metodah komunikacije med zdravnikom in pacientom. Pri ortopedskem pregledu pacienta z bolečino v kolenskem sklepu, je v sklopu diagnostike zelo pomemben klinični pregled, pri katerem najpomembnejše podatke pridobimo s palpacijo anatomskih struktur in izvajanjem raznih usmerjenih kliničnih testov gibanja (provokacijski znaki). Zahteve po zmanjšanju socialnih stikov in s tem elektivne medicinske dejavnosti, nam izvedbo tovrstnih pregledov omejujejo. Namen tega prispevka je predstaviti telemedicinski pregled pacienta z motnjami v kolenskem sklepu, opisati postopke izvedbe in kaj lahko pri telemedicinskemu kliničnemu pregledu ugotavljamo. Na koncu so predstavljene prednosti in slabosti takšnega pregleda. Ključne besede: telemedicina, telerehabilitacija, ortopedski bolniki, vadba, fizioterapija

1. INTRODUCTION

With the advent of COVID-19 coronavirus disease, as in many other medical fields, orthopedic surgeons have developed a tendency for new methods of communication between physician and patient. Due to the restriction of disease transmission in the beginning of 2020 a large part of the elective medical activity, which also includes orthopedics, decreased. Only urgent patients could come for examinations, while the others were not taken care of at the beginning.

In order for even those patients who do not meet the emergency condition to be able to contact a doctor, new telemedicine examination techniques have emerged that allow a relatively good assessment of the patient's clinical condition. Goal of such examinations was to provide patients with pain in the knee joint appropriate examination and thus identify their problems.

The new era of digital orthopedics as a potential successful management of musculoskeletal disease was additionally introduced in COVID-19 pandemic (Bini et al., 2020). Researchers (National Institute for Health and Care Excellence, 2016; Zhang et al., 2010; Victor et al., 2008) defined telerehabilitation and telephysiotherapy (TPT) as a provision of physiotherapy services at a distance (telecommunication technology, video conferencing, telephone meeting). Adhikari et al. (2020) demonstrated significant reduction in pain caused by after TPT interventions. Recently, the evidences of TPT and physiotherapeutic exercises demonstrated positive effects in rheumatoid arthritis, knee arthritis, ankle instability, post-anterior cruciate reconstruction and pain management (Gumaa and Youssef, 2019; Odole and Ojo, 2013; Stanhope and Weinstein, 2020).

Participation in a telerehabilitation program requires access to technological devices, such as smartphones, computers, and tablets, with a good Internet connection. According to data from the European Commission from 2016, as many as 79% of Europeans aged 16 to 74 accessed the Internet via mobile or smartphone. Age is therefore not necessarily a barrier to the remote use of health and medical services. Seidman et al. (2017) in an Australian study, presented significant advances in the understanding and acceptability of telerehabilitation.

Many scientific sources to date relate to general aspects of the implementation of telephysiotherapy. A key factor in patients receiving telephysiotherapy is the assessment of outcome, including functional physical performance (Beekman et al. ,2013). In this paper we present how, with help of telemedicine, we can perform a clinical examination of a patient with pain in the knee joint and identify the advantages and disadvantages. Palpation of the affected area, as well as the performance of various targeted clinical tests of movement and sensations at the end of the movement, is essential in the examination of an orthopedic patient. We will try to focus on the anamnesis and those tests that are not too complicated for the patient to perform, but can help us a lot when diagnosing.

2. METHODS

In order to answer the question from the title, literature review of orthopedics textbooks and PubMed database on telemedicine have been perfomed.

3. RESULTS

Clinical examination

Appropriate technical equipment is required to perform the clinical examination. The easiest way is with the help of a smartphone, but you can also use a personal computer with a camera. It is also desirable that the patient has a companion with him who guides the patient and helps him with the tests, and at the same time can record it. It is important that we perform the examination in a standardized way and explain to the patient why something is important to us. The instructions should be understandable and meaningful. We encourage the patient during the examination so that we do not lose his focus (Vodičar, 2021).

General physical examination and history

The installation of the camera is important as it must cover the entire patient in all positions. It can be placed on a table or lower cabinet at a distance of about 3-5 meters, so that the patient will be visible standing and sitting. During the examination he should wear only underwear or shorts. At the beginning of the telemedicine examination, the patient's anamnesis (history) is very important. Based on it, we can conclude what the problem is with the patient and direct our attention to certain tests that we want to perform.

History

During interview we ask about the leading symptom that brought the patient to us. It is important to find out what is at the forefront of the clinical picture. It can be pain, a feeling of joint instability, muscle weakness, impaired mobility with stiffness, some neurological disorder, joint deformity, or superficial signs with swelling and redness. The most common leading symptom is pain. We ask the patient how and when the pain started and their intensity, the exact area of pain and what activities pain is related to (walking, resting, at work, at night, permanently, periodically). We are also interested in what increases pain, what alleviates it and whether the reason for the pain is an injury (Tomažič et al., 2007). Mechanism of injury is an important factor, which leads to the leading symptom and can tell us about the severity of the injury (Kranjc, 2007). We ask about previous problems with the knee or possible injuries in the past. Information on the morbidity of adjacent joints is also important, as hip or lumbar spine pain can also spread to the knee. It is important to know if the patient is taking any medications, what they are and about the presence of similar clinical problems in family members. Finally, we must exclude various systemic diseases (vascular diseases, diabetes, inflammatory arthropathies, neurological diseases) (Tomažič et al., 2007).

Inspection, mobility and strength

We start monitoring the patient from the very beginning of the examination, just like in an outpatient clinic. The patient is observed while undressing and moving around the room. When the patient is ready, we first instruct him to turn towards the camera and take a few steps forward, turn 180 degrees and repeat the same number of steps in the opposite direction. In doing so we determine walking patterns (limping). Then the patient is asked to step closer to the camera, sit on a chair and determine the axis of the limb (varus, valgus). We also observe whether the knee is swollen and changes in the skin coloration around the joint. In the case of swelling, we pay attention to its extent and limitations. When the swelling is limited to the knee joint itself an effusion is likely in the joint (serous, bloody, purulent), but if the swelling spreads beyond the boundaries of the joint, it indicates more serious injuries or tumors. We continue with the inspection of muscles and determine possible muscle atrophies of the thighs and shin (m. Quadriceps, m. Triceps surae) (Tomažič et al., 2007).

Before proceeding, we instruct the patient to turn the chair 90 degrees so that we can see it from the side. Then we ask him to stretch his knee, and we estimate the extent of the extension (complete, incomplete) (Figure 1). Deficiency of full extension is important - knee contracture, as it indicates a defect in the knee joint (arthrosis, meniscus damage, painful effusion…). Deficiency or deficit of flexion is also important and should be noted. We inquire about possible pain during movement of the knee, where the pain is located, its spread, as well as crunch during contraction (sub patellar pathology). We compare range of motion to the other- healthy knee. The patient is then instructed to bend (flex) the knee so that it slides along the base until the end of flexion (Figure 2). We estimate the angle of flexion and in the meantime, we also monitor the sliding of the patella and pay attention to the anomalies (patellar instability). We ask about possible pain and location during flexion and compare it to the other knee (Cyriax, 2000).

Figure 1. Extension of the knee is observed and noted

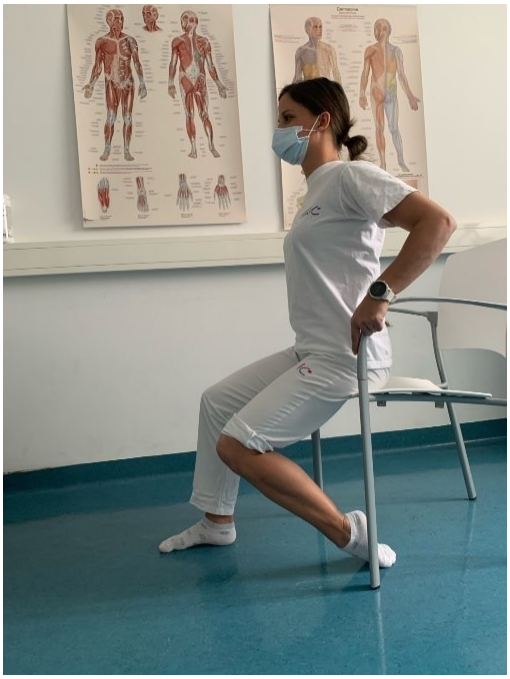

Figure 2. Flexion of the knee is observed and noted

We continue the tests while the patient stands up, grabs a chair and steps on a sore leg facing us. If he is able to stand on one leg, he should go in a slight squat (between 20-30 degrees of knee flexion). Then he should try and rotate the body left and right and report to us the location of any pain (Figure 3). This stress test detects possible damage to the menisci and collateral ligaments, and if instability of the knee joint is observed, this may also be due to damage to the cruciate ligaments of the knee joint.

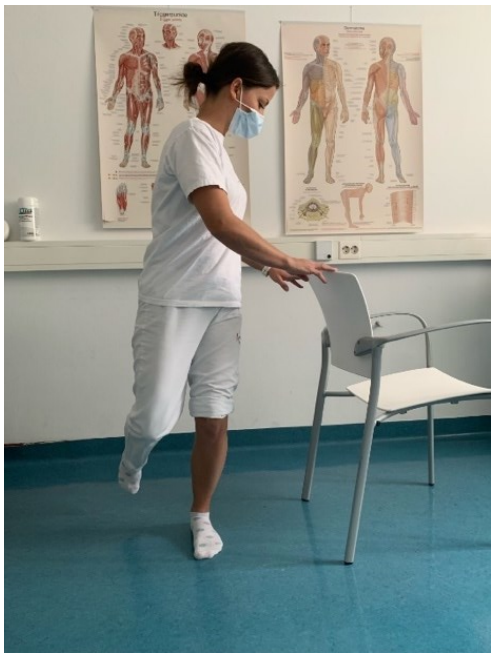

Figure 3. Rotation with slight flexion of the knee while standing is observed and pain or instability noted.

4. DISCUSSION

With the advent of the coronavirus disease COVID-19, in orthopedics, like other medical disciplines, there was a need to introduce telemedicine (Buvik, 2019). Some professions have adapted more easily than others. Healthcare professionals need to maintain a professional duty to provide care that is in line with guidelines and recommended clinical practices, regardless of the mode of care, including efforts to actively involve both patients and the service provider. Future research should influence recent regulatory changes in the implementation of rehabilitation and identify the population that may seek or benefit from telerehabilitation services. Supporting older adult users with technology-friendly equity and training physicians to engage in patient involvement can contribute to the success of telerehabilitation in increasing the health outcomes of older adults (Amon, 2021).
When exanimating orthopedic patients with knee joint disorders, this type of examination can be performed, but with certain shortcomings. We obtain less data than in an outpatient clinical examination, due to the inability to perform specific tests that the patient cannot perform alone. It is these specific and targeted tests that are often of great importance for further diagnosis and subsequent treatment (Rossi, 2011).
We believe that telemedicine treatment could be used as a kind of triage to get the patient's clinical picture and based on it, we can pre-order an emergency orthopedic examination, or send him to the emergency room, or we can send him to physiotherapy. However, the clinical value of such an examination alone cannot be equivalent to a full "live" examination of the patient. It is impossible to perform special tests of the ligament apparatus or perform specific tests, which are usually the central part of the orthopedic examination of the knee joint, within the framework of telemedicine. Telemedicine is also suitable for postoperative monitoring of patients, consultations and giving instructions for postoperative rehabilitation. Telemedicine thus enables us to control patients' condition faster and more effectively at a time when there is a need to limit personal contacts.

5. CONCLUSION

A telemedicine clinical examination of a patient with knee disorders should be performed according to an appropriate protocol to obtain as much data as possible. Despite the ever-improving technique, this type of examination still does not provide as much data as when examining a patient in person in an outpatient clinic.

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