Dear Patient,

Welcome to Diagnostic Imaging Center of the Carolina Medical Center – a modern department offering diagnostic imaging of unique quality: Magnetic Resonance (MRI), Computed Tomography (CT), Ultrasound scans (USG) and X-ray. Our Center cooperates with a team of excellently qualified and experienced radiologists and technicians, who put exactness and thoroughness first in their work.

We have high technology medical equipment at our disposal with its parameters optimally preset to diagnose illnesses of the musculoskeletal system, including traumas. This enables us to render unique quality of imaging examination which is the starting point for correct diagnosis.

Please read this Patient Guide to learn as much as possible about Magnetic Resonance and Computed Tomography Imaging: what they are, why they are performed, how they are carried out, and last but not least, how to get prepared for them. We are hoping to clear all your doubts. However, should you still have any questions, please do not hesitate to ask our staff or call the hotline. Our goal is to make you fully informed and thus convinced of the rightness of performing recommended diagnostic tests.

MAGNETIC RESONANCE
WHAT IT IS AND HOW IT WORKS

Magnetic Resonance (MRI) is a very thorough imaging method, mainly of the soft tissues of human body, including those deeply located, and thus invisible e.g. in an ultrasound examination.

Magnetic Resonance Imaging is based on the magnetic field and does not use the X-radiation. MRI imaging consists of performance of a number of sequences of the investigated human organ. MRI allows to sort of slice the investigated structure. Each sequence contains many slices, the thinner and more densely packed they are the more exact is the imaging. For example, if we want to know the number of sunflower seeds baked into bread, we can’t learn it if we slice the bread into thick slices. In order to obtain a reliable image, we need as many thin slices of bread as possible.

At the Diagnostic Imaging Center of the Carolina Medical Center, it takes more time to perform an MRI examination than at other medical centers, because we do much more sequences of the investigated organ, therefore obtain a high resolution examination. At other centers, a standard examination of e.g. knee joint, takes approx. 20 minutes, while it takes over one hour for our MRI laboratory to do an MRI scan. This guarantees us and our patients more exact diagnosis and better chance for cure.
At the Carolina Medical Center, Magnetic Resonance Imaging is used for:

- imaging of the musculoskeletal system: joints, ligaments and muscles;
- detection of inflammatory foci, overload lesions or the swelling of muscles or bone tissue at an early stage of damage, which is extremely important for people engaging in sports.

We also offer colored imaging of the joint cartilage, which in a fully comprehensible manner shows the extent of pathological lesions and the degree of damage of the cartilage. The examination is performed on patients with minor damage which quite often is difficult to reveal using different methods.

We also perform arthrography of joints and ligaments. Arthrography is performed after injecting 10-20 ml of contrast agent or physiological saline into the joint. The joint is punctured immediately before the MRI under the control of an ultrasound at our laboratory. The joint becomes dissented which is conducive to a better imaging of the area under examination since the contrasting agent flows into defects / fissures of the cartilage, ligaments or helix. After the examination, the joint cavity returns to its normal size.

Arthrography is used for assessment of damages to cartilaginous and ligamentous elements of joints with more complicated structure, like e.g. the shoulder, hip, wrist or less frequently knee joint.

HOW TO PREPARE FOR THE EXAMINATION?
HERE ARE SOME USEFUL TIPS

BEFORE COMMENCEMENT OF THE EXAMINATION LET THE DOCTOR KNOW IF ANY OF THE FOLLOWING APPLIES:

- Accepted drugs – the doctor who refers you to MRI will decide whether you may take the drugs before and after the test.
- Presence of metal implants in the body (vascular clips, prosthesis, screws, wires, plates). If you have any of these, it is necessary to present a document/certificate containing the characteristics of the alloy of which the implant was made or a certificate of insertion of the implant for MRI imaging examination issued by the manufacturer. Without those documents, the examination cannot be performed for your safety. If possible, it is recommended to submit an X-ray imaging showing the implant.
- Presence of other metallic objects in the body (shards, bullets...); it is necessary to provide an X-ray imaging showing the metal fragment.
- If you are a woman, you must provide the date of the most recent menstruation. It is not recommended to have MRI performed in the first trimester of pregnancy.

REQUIRED MEDICAL DOCUMENTATION

In order to have an MRI performed, you DON’T NEED a medical referral from your physician.

If, during the examination, contrast agent is injected intravenously or into joints: the current level of creatinin (eGFR) in the blood should be presented - the blood test is valid for one (1) month.
You should bring with you the results (description + CD) of your most recent (not older than 3 months) X-ray or possibly CT of the anatomic area to be examined.

- Do not forget your identity document!

CLOTHES AND MAKEUP

- You will be asked to leave your clothes in the changing room for the time of the examination. You may have your underwear except when it has metal components (e.g. support wires in the bra). You will receive a disposable interlining chemise and foot protectors.
- All electronic and magnetic objects (such as payment cards) or containing metal and jewelry must be left at the changing room for the time of the examination; remember about it when making appointment for the examination.
- Also, when you are to have the MRI performed (in particular the scan of the head), please do not wear any makeup; cosmetics contain particles of color metals, or the hair spray, hence it may affect the image.

EATING AND DRINKING BEFORE MRI

- It is recommended not to drink large volumes of liquids.
- You don’t need to be fasting before the examination.

EXCEPTION: In the event of imaging with intravenous contrast, we kindly request the patient to be fasting.

WHAT DOES THE COURSE OF THE EXAMINATION INVOLVE?

The examination is non-invasive and painless, however, the prospect of remaining completely still in a narrow tube of the MRI apparatus involves high stress for many patients. Learn about the course of the examination and what you can expect so that you are not surprised by anything.

Before the MRI you will receive a questionnaire to fill in, not only with your personal details but also information about your health condition. You will also have to grant your written consent to the MRI examination. It will take approx. 15 minutes to fill in the documentation, which is why we would like to request you to arrive to the clinic earlier.

In certain instances, special contrasting agent is administered intravenously to a patient during the examination, so that not only the structures, but also functions of tissues and organs are imaged.

For an examination involving intravenous injection of contrasting agent, a catheter will be installed.

The patient will be requested to lie down in an appropriate position, depending on the investigated area, on a shifted table in the center of the scanner of the Magnetic Resonance equipment. For your better comfort, the staff may provide you with a pillow and a blanket for the time of the examination. You must not move during the examination so that the image is not distorted.

Remember that the medical staff performing the examination is there for you! Your comfort is most important for us, so you are free to report all your fears and ask us any questions!

The tunnel is equipped with air conditioning, lighting and monitoring inside, so that the staff are constantly in contact with you and can respond to any signal you give them.

In the event that you feel discomfort during the examination, let the staff know about it by pressing a button in the buzzer, which you can hold in your hand throughout the time of the examination.
Computed tomography (CT) is a diagnostic method using x-radiation to obtain cross-sectional imaging of the inside of human body. The main components of a computed tomograph include the x-ray tube and detectors suspended on the opposite sides of a round rim. The x-ray tube generates radiation which goes through the body of a patient lying inside the computed tomograph and is received by detectors. The x-ray beam penetrating the body is absorbed to a different degree by the tissues of the human body. The detectors are able to measure the level of absorption of the x-rays. On the basis of the measurements, a cross-sectional image of the body is developed. Bones, which most intensely absorb x-radiation are shown in white, and other tissues in different shades of grey.

LIMITATIONS AND CONTRAINDICATIONS TO MRI

MR imaging is safe, however, there are certain contraindications. A patient cannot undergo MRI, if they have:

- Pacemaker;
- Cochlear implants,
- infusion pump,
- metallic foreign body in the eye,
- or if she is in the first trimester of pregnancy.

RESULTS OF THE EXAMINATION

You can receive the result of the examination directly after its completion on a CD/DVD; if you wish to receive the result directly after the examination you should inform the staff about it.

However, you must wait for the description of the examination at least six (6) days. As soon as the documentation is ready for collection, we will notify you by sending SMS.

You can collect the description of the examination at the reception desk on the ground floor, from Monday to Friday, from 7:30 a.m. to 8:30 p.m.

COMPUTED TOMOGRAPHY

WHAT IT IS AND HOW IT WORKS

Computed tomography (CT) is a diagnostic method using x-radiation to obtain cross-sectional imaging of the inside of human body. The main components of a computed tomograph include the x-ray tube and detectors suspended on the opposite sides of a round rim. The x-ray tube generates radiation which goes through the body of a patient lying inside the computed tomograph and is received by detectors. The x-ray beam penetrating the body is absorbed to a different degree by the tissues of the human body. The detectors are able to measure the level of absorption of the x-rays. On the basis of the measurements, a cross-sectional image of the body is developed. Bones, which most intensely absorb x-radiation are shown in white, and other tissues in different shades of grey.

The images of the examined structures come as 2D or 3D images. At the Carolina Medical Center, we use Philips Brilliance CT 40 computed tomograph.
Computed Tomography very well shows all bone injuries.

At the Carolina Medical Center, we use computed tomograph to show:
- intra-articular fractures before the planned surgical procedure,
- assessment of post-operative complications (e.g. bone union disorders),
- patellofemoral joint,
- limb/bone rotation,
- assessment of the bone structure – inflammation, tumors,
- assessment of intra-articular structures after injection of Artro-TK contrasting agent into joint.

Computed tomography imaging is also carried out with patients with contraindications for MRI imaging (e.g. those with metal implants, pacemaker, etc.).

We also carry out arthrography of joints and ligaments.

Arthrography is performed after intraarticular injection of 10-20 ml of contrasting agent. Puncture of the joint is performed at our laboratory immediately before the tomography under the control of ultrasound. The joint becomes dissected which is conducive to a better imaging of the area under examination since the contrasting agent flows into defects / fissures of the cartilage, ligaments or helix. After the examination, the joint cavity returns to its normal size.

Arthrography is used for assessment of damages to cartilaginous and ligamentous elements of joints with more complicated structure, e.g. the shoulder, hip, wrist or less frequently knee joint.

The arthrography of joints and ligaments is only performed with patients above 18 years of age.

HOW TO PREPARE FOR THE EXAMINATION?
HERE ARE SOME USEFUL TIPS

BEFORE COMMENCEMENT OF THE EXAMINATION LET THE DOCTOR KNOW IF ANY OF THE FOLLOWING APPLIES:
- allergy and allergic reactions, in particular to contrasting agents,
- tendencies to hemorrhages,
- pregnancy or suspected pregnancy, or claustrophobia,
- medication you take – the doctor who refers you to tomography will decide whether you may take the drugs before and after the tomography.

REQUIRED MEDICAL DOCUMENTATION

In order to undergo CT scan, you must be referred by a physician. If, during the examination, contrasting agent is injected intravenously or into joints, the current level of creatin (eGFR) in the blood should be presented - the blood test is valid for one (1) month. If you have already had a CT or other diagnostics (X-ray, USG, MRI) of the anatomic area to be examined, please bring the results (description + CD) with you. Do not forget your identity document.
CLOTHES AND MAKEUP

You will be asked to leave your clothes in the changing room for the time of the examination. You may have your underwear except when it has metal components (e.g. support wires in the bra). You will receive a disposable interlining chemise and foot protectors.

Remember to remove all metal objects, such as jewelry, glasses, external hearing aid – if they are in the vicinity of the examined area.

EATING AND DRINKING BEFORE CT SCAN

In the event of examination with contrasting agent, you should be fasting and not eat anything at least for six hours before the examination. You can eat after the examination is completed. In order to excrete the contrasting agent from the organism more easily, it is recommended to drink large amounts of liquids (approx. 2.5 liters of non-carbonated water or unsweetened drinks within the next 24 hours).

WHAT DOES THE COURSE OF THE EXAMINATION INVOLVE?

Learn how does the examination look like and what you can expect so that you are not surprised by anything.

Before the examination, you will receive a questionnaire to be filled in, in which you will be asked about your personal details as well as to provide information about your condition of health. It will take approximately 10 minutes to fill in the documentation, which is why you are kindly requested to arrive earlier to the clinic. Computed Tomography is a painless short-term examination.

Depending on which organ is to be examined, the examination will take from few seconds to few minutes. If a contrasting agent is injected intravenously for the examination, a vein puncture will be necessary to insert a catheter. Sometimes, after administration of the contrasting agent, the patient may feel transient feeling of warmth or urinary urgency, possibly accompanied by slight nausea. Undesirable effects occur rarely and usually do not last long.

The medical staff will ask you to lay down on a special moving table, which will be inserted inside of the apparatus during the examination, depending on the type of the examination you will be asked to lie down on your front, back or side. The X-ray lamp will revolve around you and register images. You should stay still during the examination, since any movement may result in a blurred image. You may be asked to hold your breath for a while.

After the scanning of the body within the selected scope, the platform will leave the tomograph and the examination will be completed. Subsequently, the completed examination is analysed by a physician, the images are digitally processed, and the description and documentation of the examination are prepared.

RESULTS OF THE EXAMINATION

You can receive the result of the examination directly after its completion on a CD/DVD; if you wish to receive the result directly after the examination you should inform the staff about it.

However, you must wait for the description of the examination at least six (6) days. As soon as the documentation is ready for collection, we will notify you by sending SMS. You can collect the description of the examination at the reception desk on the ground floor, from Monday to Friday, from 7:30 a.m. to 8:30 p.m.

LIMITATIONS AND CONTRAINDICATIONS TO CT

In the computed tomography, the energy is carried by x-beams, i.e. the x-radiation, which, during a CT examination may be as much as 500 times stronger than while performing an ordinary X-ray. Therefore, it cannot be performed frequently, in too short time intervals. CT examination is limited to the minimum necessary with children.

Pregnancy is an absolute contraindication for CT – a high dose of x-radiation could be harmful for a child. The CT examination may be performed at any time during the menstruation cycle, however, it is recommended that it is performed until the 10th day of the cycle so as to avoid exposure of an undetected early pregnancy to radiation.

Remember that the medical staff performing the examination is there for you!
Your comfort is most important for us, so you are free to report all your fears and ask us any questions!
Ultrasound (USG)

- Surface soft tissues and small joints (damage to ligaments, torsion injuries of the ankle joint, injuries to muscles, ligaments, surface structures of the knee joint: patellar ligament and lateral ligaments).
- Ultrasound apparatus cannot “see” well the deeper structures: such as the meniscus, cartilages, patellar joint, tibias, or collateral ligaments.
- The possibility of dynamic examination, i.e. assessment of the internal structures in movement.
- In a situation where a ligament is only painful while walking, the ultrasound examination will show how the ligament behaves in specific movement.

X-ray

- On the basis of X-ray imaging, the structure of the bone tissue is assessed for potential fissures and fractures. X-ray examination is unsuitable for assessment of other tissues, e.g. traumas of ligaments or muscles.
- X-ray examination only show contours of soft tissues rather than their structure.

Magnetic Resonance (MRI)

- All soft tissues, including the deep tissues obscured by bones therefore out of reach of the ultrasound equipment. MRI is performed in the case of torsion injuries, partial or complete rupture of ligaments (e.g. cruciate ligaments of the knee), with a view to assessing the condition of cartilages, e.g. in the knee, or traumas of the spine. However, MRI does not allow for dynamic assessment of the tissues (i.e. in movement).
- MRI is a very thorough examination used to investigate all soft tissues. MRI is not based on x-rays but on the magnetic field.

Computed Tomography (CT)

- This examination is performed primarily to assess bone elements. It is used to diagnose complicated osseous traumas which are difficult to discover in an X-ray imaging: such as intra-articular fractures before the planned surgery, assessment of disrupted synostosis, exact assessment of the bone structure and other.
- Patients with contraindications (e.g. metal implants, pacemaker) for MRI examinations undergo CT.

Contrasting agents used in MRI and CT are excreted via kidneys. They may cause undesirable reactions which however are rare, and are usually mild and short-term. They include:

- Nausea, vomiting, taste disorders, fatigue, dermatitis,
- Paresthesia, skin reactions, urticaria, itching, skin pallor, eczema,
- Pain and cold or hot sensation at the place of administration of the agent, pains and muscle contractions,
- Fluctuating consciousness, epilepsy, headache and hot sensation;
- Anaphylactic reactions: swelling of vessels, anaphylactic shock, sudden circulatory arrest, reduced blood pressure, laryngeal oedema, laryngeal or bronchial spasm, stridor, pulmonary oedema, breathing disturbances, coughing, rhinitis, sneezing, conjunctivitis, stomach pain, chest pain, rash,
- Interruption of the continuity of vein, extravasation of the contrasting agent beyond the vein.

Remember to report any sudden discomfort during the examination to the staff!

In most of the cases, examination with a contrasting agent has no effect on the functioning, therefore, no company is required. There are no contraindications to drive after the diagnostic examination.

As much as 96% of our patients would recommend us to their closest ones.*

* According to a survey of patients’ satisfaction