Therabotics 2030: The Future of Robotic Therapy

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Robotic technologies and their clinical applications play an increasingly important role in the fields of neurosurgery and neurorehabilitation. Novel robotic applications are being developed or are already in standard clinical use within the different therapeutic phases ranging from diagnostic imaging and surgical technologies via therapeutic treatments in the acute, subacute, and chronic stage of rehabilitation, to the use of mobile or telemedical applications assisting patients in daily life.

All robotic systems being applied in the different fields of neurosurgery and neurorehabilitation must comprise particular technical features to become effective, efficient and accepted by the patients and clinicians. These features include multimodality, transparency, cooperativity, adaptivity, and temporal as well as spatial intensity. With these features the therapeutic outcome can be increased in order to improve the patients' quality.

Several methods and applications will be presented showing how such technical features can be implemented in the therapy. For instance, to support gait or upper extremity function, so-called patient-cooperative, auto-adaptive controllers take into account the patient's motor capabilities and efforts rather than imposing any predefined movement. Novel model-based approaches enable to compensate the robot dynamics, thus making the device transparent for the patient. Audiovisual displays in combination with the robotic device can be used to present a virtual environment and let the patient perform different movement tasks and activities of daily living. Sensors implemented in the robots allow to measure and assess the patient's performance and therapy status.

There is already a clear tendency of increased acceptance and use of robotic technology in neurorehabilitation hospital environments. We believe that future neurosurgical interventions and neurorehabilitative treatments will further benefit from such novel human-centered robotic technologies. This talk will give a visionary overview about these robotic technologies applied to therapy as we expect them to be prominent in about 20 years from now – that is what we call Therabotics 2030.