

Multidisciplinary Treatment of Central Nervous System and Spinal Metastases on the Example of a Patient with Ovarian Cancer, Principles of Management. The Concept of Oligometastatic Disease

Multidyscyplinarne leczenie przerzutów do Ośrodkowego Układu Nerwowego i kręgosłupa na przykładzie pacjentki z rakiem jajnika, zasady postępowania. Pojęcie choroby oligometastatycznej

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Abstract

Introduction. The development of modern diagnostic methods, surgical techniques, novel systemic treatment or radiotherapy makes it possible to achieve increasingly better results in the treatment of neoplastic disease. This is particularly noticeable in the approach to metastases of malignant neoplasms. Nowadays, the concept of oligometastatic disease, or otherwise metastatic disease, which we treat, significantly prolonging and improving the quality of life of patients, has appeared in the literature and in medical practice.

Aim. The aim of the study is to show the multidisciplinary treatment of central nervous system and spinal metastases on the example of a patient with ovarian cancer.

Case Report. The author of this paper would like to show, on the example of a fifty-year-old patient with ovarian cancer, how the application of modern treatment techniques has made it possible over the years to successfully treat multiple metastases to, among others, the brain and the spine.

Discussion. I present the diagnostic and treatment regimen that has made it possible to control the Patient's cancer over the years. I demonstrate the interaction between different specialists and the decision-making process that guided us in taking certain actions. I show that this approach can be applied not only to a single case but also for general use.

Conclusions. I would like to emphasise that only a multidisciplinary, hybrid approach to the problem of a neoplastic disease, especially in the area of metastases, promises further improvements in treatment outcomes. (JNNN 2025; 14(2):86–90)

Key Words: hybrid treatment, multidisciplinary treatment, oligometastatic disease

Streszczenie

Wstęp. Rozwój nowoczesnych metod diagnostycznych, technik operacyjnych, nowatorskiego leczenia systemowego czy radioterapii pozwala osiągać coraz lepsze wyniki leczenia choroby nowotworowej. Szczególnie zauważalne jest to w podejściu do przerzutów nowotworów złośliwych. Obecnie w literaturze oraz w praktyce medycznej pojawiło się pojęcie choroby oligometastatycznej inaczej choroby przerzutowej, którą leczymy, znacząco przedłużając i poprawiając komfort życia pacjentów.

Cel. Celem pracy jest przedstawienie multidyscyplinarnego leczenia przerzutów nowotworowych do Ośrodkowego Układu Nerwowego i kręgosłupa na przykładzie pacjentki z rakiem jajnika.

Opis przypadku. Autor pracy chce na przykładzie 50-letniej pacjentki z rakiem jajnika pokazać jak zastosowanie nowoczesnych technik leczniczych pozwoliło przez lata skutecznie leczyć mnogie przerzuty między innymi do mózgu i kręgosłupa.

Dyskusja. Przedstawiono schemat postępowania diagnostyczno-leczniczego, który pozwolił przez lata kontrolować chorobę nowotworową u pacjentki. Pokazano wzajemne współdziałanie różnych specjalistów oraz proces decyzyjny jaki przyświecał w podejmowaniu takiego czy innego działania. Pokazano, że można to zastosować nie tylko do jednego przypadku, ale do powszechnego zastosowania.

Wnioski. Autor pokreśla, że tylko multidyscyplinarne, hybrydowe podejście do problemu choroby nowotworowej, szczególnie w zakresie przerzutów rokuje dalszą poprawę wyników leczenia. (PNN 2025;14(2):86–90)

Słowa kluczowe: leczenie hybrydowe, leczenie multidyscyplinarne, choroba oligometastatyczna

Introduction

Neoplastic disease is consistently a major health problem in the modern world. In Poland, approximately 171,000 new cases of malignant neoplasms were reported in 2019 [1]. However, the constant development of diagnostics, modern surgical techniques, innovative systemic treatment or radiotherapy, especially radiosurgery, makes it possible to achieve increasingly better treatment results. In the field of diagnostics, there is a growing, even crucial importance of genetic testing, which makes it possible to very precisely adapt systemic treatment in the field of chemotherapy, hormone therapy or immunotherapy individually to the neoplasm and the patient. In the field of surgery, the introduction of treatments using minimally invasive, endoscopic or robotic techniques. Tremendous progress has also been made in radiotherapy, where classic treatment methods are increasingly being replaced by stereotactic radiosurgery, which, using precise methods of spatial localisation, makes it possible to use much higher doses of radiation for treatment without damaging healthy tissue.

In the literature, for several years now, there has also been a growing number of reports not only on the emergence of a new drug, a new more effective diagnostic method or a modern treatment, but increasingly attention is being paid to a multidisciplinary approach to the problem of neoplastic disease. It is stated that only the synchronised, hybrid application of different treatment methods significantly improves the length and comfort of patient survival. This is particularly evident in the approach to malignant neoplasm metastases to different organs. The extended survival time of patients with neoplastic disease, paradoxically, increases the number of metastases detected. Until a few years ago, multiple metastases were a factor disqualifying a patient from further oncological treatment, leaving them only to palliative or even symptomatic treatment. For several years now, the concept of oligometastatic disease has emerged in the literature and in medical practice, which is defined as the presence of 1–5 metastases (or more if radical removal or eradication is possible) in up to two locations that can be safely removed by local treatment techniques and a primary tumour under therapeutic

control (optimally — removed) [2]. Increasingly, thanks to a multidisciplinary approach (interaction of many specialists) using state-of-the-art therapeutic methods, metastases can be controlled for longer and more effectively, which not only improves the quality of life of patients with metastatic neoplastic disease, but by extending the time and quality of survival makes it possible to continue treatment of the primary neoplasm [3].

The central nervous system (CNS) and spine are organs in which metastases are often located. This is related to the rich vascularisation of these organs and the hematogenous route is most commonly used for metastasis by the primary neoplasm. CNS and spine metastases most often result from lung cancer, breast cancer, prostate cancer, melanoma, colorectal cancer or ovarian cancer.

The aim of the study is to show the multidisciplinary treatment of central nervous system and spinal metastases on the example of a patient with ovarian cancer and principles of procedure.

Case Report

The patient, aged 50, was diagnosed with ovarian cancer in 2017, histopathological diagnosis *Clear cell carcinoma*, stage IV, T2, Nx, M1 with metastasis. After a thorough diagnosis at the Oncology Centre, radical surgical treatment was administered, which was complemented by radical radiotherapy to the tumour bed with the reproductive organs with a margin of lymph nodes and subsequent intraluminal brachytherapy. The Patient was also treated with systemic therapy. A complete remission was achieved after treatment and the patient returned to her previous job as a nurse, remaining under close oncological care. In February 2022, she began to experience neck pain and headache, which intensified with movement. The Patient underwent an MRI scan of the cervical spine, which showed a suspicious lesion in the body of C2 vertebra and the right lateral mass, as well as in the body of Th2. In March 2022, the Patient was scheduled for biopsy of the lesion under general anaesthesia. The histopathological result of the biopsy

confirmed metastatic ovarian cancer. After the oncological consultation, the Patient was qualified for radiosurgery (SRS — stereotactic spine radiosurgery) of the two spinal lesions observed on the MRI scan. The procedure was performed without complications followed by reintroduction of systemic treatment. From July 2022, the Patient developed severe neck pain and headache, accompanied by dizziness and numbness in the upper limbs. The pain was alleviated by the Patient holding her head with her hands. The diagnostics performed showed a pathological fracture of the C2 dens with anterior subluxation, instability at the C2-C3 intervertebral joints with subsequent spinal cord compression at this level through the posterior arch of the C1 vertebra. The Patient was qualified for surgical treatment, which took place at the Department of Neurosurgery of the Specialist City Hospital in Toruń. Taking advantage of the break in systemic treatment, a laminectomy of the C1 arch was performed in August 2022, decompressing the spinal cord, as well as occipito-cervical stabilisation to the C5 level. The treatment resulted in significant resolution of the complaints, with limited mobility of the head relative to the spine, which did not impede normal life. The Patient was able to return to further systemic treatment and to work. A follow-up chest CT scan showed a single small metastatic focus in the left lung confirmed by a PET scan. In November, radiosurgery (SBRT — Stereotactic Body Radiation Therapy) was performed on the lung lesion without complications. In February 2023, headaches, dizziness, as well as memory and orientation disturbances reappeared. An MRI scan revealed two metastases in the right frontal lobe and left cerebellum hemisphere. The Patient underwent single-dose radiosurgery for both lesions. Follow-up imaging showed a decrease in the size of the metastatic focus in the cerebral hemispheres, while the focus in the cerebellum did not decrease and was even increased in size on a subsequent MRI scan. This led to the Patient being qualified for surgical removal of the single lesion in the cerebellum. In March 2024, a left-sided suboccipital craniectomy was performed with complete removal of the lesion. During preparation for the procedure, there were significant intubation difficulties requiring the use of a fiberscope due to the occipito-cervical stabilisation and the inability to tilt the head. The surgeon also had to take into account the previous procedure when planning the craniectomy. Post-operative period without complications. The Patient remains under oncological care.

Discussion

Since 2019, the Department of Neurosurgery at the Specialist City Hospital in Toruń has been cooperating with the Oncology Centre in Bydgoszcz as part of the Central Nervous System Oncology Consultations. During the meetings, a specialist neurosurgeon, radiotherapist, and oncologist discuss patients with neoplastic disease at various stages of its development and determine the further treatment scheme. The therapeutic process that is then established must take into account all treatment options used by different specialists and allow for their synchronisation to optimise treatment. This required learning about the therapeutic possibilities of the various medical disciplines involved in the treatment process, and finding a common language in assessing the patient's condition and jointly qualifying for a particular type of treatment. It was apparent that we knew very little about the therapeutic possibilities of the various specialities. In the case of spinal metastases, we gained immense assistance from the work on the recommendations of the Polish Society of Spinal Surgery regarding diagnostic and therapeutic management of spinal neoplasms [4]. The information contained there allowed us to develop common principles for the management of these cases. In 2013, a group of experts at Memorial Sloan-Kettering Cancer Center in New York proposed a multidisciplinary approach to the problem of spinal metastases, taking into account the neurological status of the patient (neurologic — N), i.e. the relationship of the metastasis to the neural structures of the spinal canal, the oncology of the tumour (oncologic — O), mainly sensitivity to radiotherapy, the stability of the spine (mechanical — M) and the patient's overall condition (systemic — S), above all, whether or not surgical treatment is possible [5]. An acronym — NOMS — was created from the first letters of the English words. We decided to use the principles contained in this proposal to evaluate patients with spinal metastases during the consultations. In this paper, in addition to a management diagram to facilitate decisions on eligibility for one therapy or another, the authors have also proposed scales to describe and objectify the various parameters contained in this proposal. When describing the neurological status, we use the 6-point ESCC (Epidural Spinal Cord Compression) scale, in which, based on an MRI scan of the spine in T2 time, we assess the relationship of the metastatic tumour to the neural structures of the spinal canal and decide on qualification for surgical treatment or radiosurgery [6]. In the assessment of tumour oncology, we primarily consider the radiosensitivity and radioresistance of the primary neoplasm to radiotherapy. In the case of modern stereotactic radiotherapy techniques, the problem is also slowly becoming irrelevant. Radiosurgery is a unique treatment method that involves delivering high doses

of radiation to the area of the tumour with minimal volume of surrounding healthy tissue, which eliminates the problem of tumour radioresistance. The next parameter described in the NOMS scheme is the assessment of spinal stability. Spinal metastases destroy the osteo-articular structure of individual vertebrae, leading to pathological fractures that affect the disruption of the basic functions of the spine, such as the protection of neural structures, maintaining spinal stability, and spinal mobility. This generates severe pain and the risk of damage to neural structures, which may lead to paralysis. In order to assess these disorders, the Authors of the paper proposed the SINS (Spinal Instability Neoplastic Score) scale, which numerically evaluates six parameters on the basis of an MRI of the spine, the sum of which ranges from 0–18 points [7]. A value of 0–6 means the spine is assessed as stable — it does not require surgical intervention; a value of 7–12 means the spine is considered potentially unstable and the decision to operate is determined by the patient's other parameters; a value of 13–18 means the spine is considered highly unstable, which requires immediate surgical stabilisation. Finally, there remains the assessment of the Patient's general condition, the extent of the neoplastic disease in other organs, further treatment options for the primary disease and an evaluation of the Patient's potential survival time. This enables a holistic view of the disease process, determination of further treatment prospects, assessment of other concomitant non-cancerous conditions, as well as asking the Patient's opinion on the proposed therapy.

In the case of CNS metastases, we are mainly guided by the number of metastases, their location, their size assessed by contrast-enhanced MRI scan, surgical availability, as well as the type and possibility of using radiotherapy, and the Patient's general condition.

I will now outline how we made treatment decisions based on the case presented, guided by these principles.

In 2022, when the patient presented 4 years after the end of oncological treatment with a spine MRI result suggesting pathological foci in the C2 and Th2 vertebrae, we had to take into account a new, different neoplastic process or non-cancerous conditions such as spinal inflammation, which is often difficult to recognise in imaging studies, even PET. Hence the decision to biopsy the lesion, in line with the recommendations of the Polish Society of Spine Surgery. After obtaining the histopathological result confirming the metastasis of the ovarian cancer, we evaluated the Patient using the ESCC and SINS scales. We obtained the following values for the C2 vertebra — ESCC-1c, i.e. without significant compression on the spinal cord and SINS-7, i.e. potentially unstable, and for the Th2 vertebra — ESCC-1b and SINS-5. Given the location of the metastases of great surgical difficulty, we decided to perform radiosurgery. This enabled a good therapeutic and painkilling effect

while also enabling the rapid application of systemic treatment. Four months after radiotherapy, symptoms of instability appeared in the irradiated area at the C2–C3 level, while the Th2 vertebral body showed no signs of fracture. The literature reports that 15% of patients undergoing spinal radiosurgery develop fractures and instability within four months of surgery due to the neoplasm destroying the osteoarticular structure of the spine and radiosurgery destroying the neoplasm [8]. Therefore, patients who have undergone radiosurgery must be monitored for this. Having found the Patient unstable, after consultation with the oncologist to choose the most convenient date to interrupt the systemic treatment, we performed occipital-spinal decompression and stabilisation. The effectiveness of the radiotherapy is demonstrated by the fact that the bone material taken from the destruction site showed no neoplasm cells. The past treatment with radiosurgery and spinal stabilisation did not exclude the use of radiosurgery again for the treatment of a single metastasis in the left lung. In March 2023, an MRI scan of the head with contrast found two metastases, one in the right frontal lobe region measuring 17×18 mm and one in the left cerebellar hemisphere measuring 11–13 mm with small zones of swelling. Modern radiosurgery enables up to a dozen metastatic foci in different brain areas to be irradiated at one time, being the most effective in the case of small foci not exceeding 30 mm in diameter. A single dose of radiation is usually administered; the procedure lasts about 20 minutes and is carried out on an outpatient basis. Taking this into account, this was the treatment used in the Patient. Subsequent head MRI scans performed every three months showed a gradual shrinkage of the foci in the frontal lobe to 4×3 mm, whereas the foci in the left cerebellar hemisphere did not respond to radiotherapy, enlarging to a size of 22×23 mm with a zone of oedema in January 2024. This led to qualification for surgery to remove the metastatic focus from the left cerebellar hemisphere. This surgery was performed as well.

The example presented here shows how cooperation, combining different therapeutic techniques and joint decision-making based on up-to-date knowledge, has made it possible to treat a Patient with disseminated cancer for 2 years already. Of course, I cannot forget the enormous commitment of the Patient herself, her optimistic attitude to the disease, and her will to fight and not give up in the face of adversity. Throughout all this time, with short periods of decreased well-being and increased pain and neurological symptoms, the Patient practised her profession as a nurse, developed professionally and devoted her time to other oncological patients, supporting and sustaining them.

Conclusions

1. The development of modern therapeutic methods (diagnostic, oncological, radiotherapeutic and surgical) necessitates constant modification of the treatment of metastatic malignancies.
2. Treatment decisions should be made by a multi-specialist therapeutic team.
3. The use of hybrid therapeutic techniques is recommended in order to achieve a long-term treatment effect and to improve the quality of life of patients with metastases.
4. Only the cooperation of many specialists based on mutual interaction promises further progress in the treatment of metastases.
5. It is advisable to create a network of institutions specialising in neoplasm treatment.

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References

- [1] Krajowy Rejestr Nowotworów <http://onkologia.org.pl>
- [2] Hellman S., Weichselbaum R.R. Oligometastases. *J Clin Oncol.* 1995;13(1):8–10.
- [3] Patchell R.A., Tibbs P.A., Regine W.F. et al. Direct decompressive surgical resection in the treatment of spinal cord compression caused by metastatic cancer: a randomised trial. *Lancet.* 2005;366(9486):643–648.

- [4] Maciejczak A., Gasik R., Kotrych D. et al. Spinal tumours: recommendations of the Polish Society of Spine Surgery, the Polish Society of Oncology, the Polish Society of Neurosurgeons, the Polish Society of Oncologic Surgery, the Polish Society of Oncologic Radiotherapy, and the Polish Society of Orthopaedics and Traumatology. *Eur Spine J.* 2023;32(4):1300–1325.
- [5] Laufer I., Rubin D.G., Lis E. et al. The NOMS framework: approach to the treatment of spinal metastatic tumors. *Oncologist.* 2013;18(6):744–751.
- [6] Bilsky M.H., Laufer I., Fourny D.R. et al. Reliability analysis of the epidural spinal cord compression scale. *J Neurosurg Spine.* 2010;13(3):324–328.
- [7] Fisher C.G., DiPaola C.P., Ryken T.C. et al. A novel classification system for spinal instability in neoplastic disease: an evidence-based approach and expert consensus from the Spine Oncology Study Group. *Spine (Phila Pa 1976).* 2010;35(22):E1221–1229.
- [8] Kim Y.R., Lee C.H., Yang S.H. et al. Accuracy and precision of the spinal instability neoplastic score (SINS) for predicting vertebral compression fractures after radiotherapy in spinal metastases: a meta-analysis. *Sci Rep.* 2021;11(1):5553.

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