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IV Congress of Polish Brachytherapy Society

28th–30th November 2013
Białowieża, Poland

Programme and abstracts

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POLSKIE
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RADIOTERAPII
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PTB
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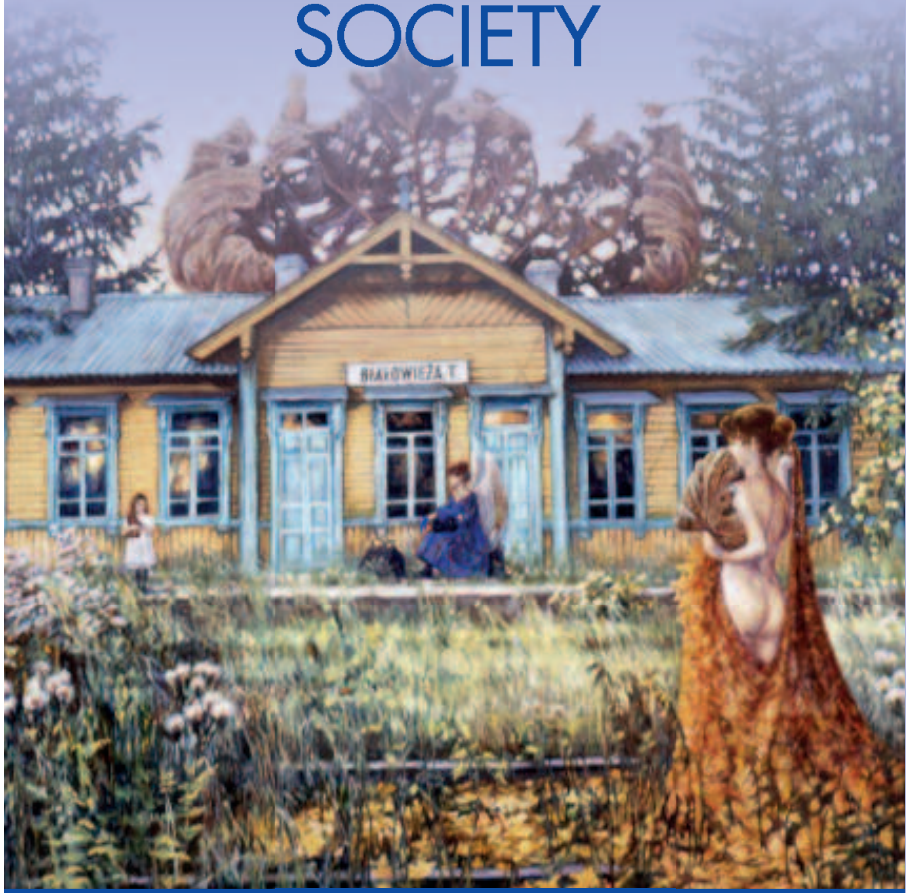
Brachyterapii

Białostockie
Centrum
Onkologii

IV CONGRESS OF POLISH BRACHYTHERAPY SOCIETY



Białowieża 28-30 November 2013

Programme overview

Thursday, 28th November 2013

4.00 p.m. – 6.00 p.m. **Registration**

6.00 p.m. – 6.10 p.m. **Welcome**
Jarosław Łyczek (Brzozów, Poland)
Janusz Skowronek (Poznań, Poland)
Tomasz Filipowski (Białystok, Poland)

OPENING LECTURE

6.10 p.m. – 6.55 p.m. Quality in radiotherapy, a never ending story
Pierre Scalliet (Leuven, Belgium)

6.55 p.m. – 7.40 p.m. Role of brachytherapy in children cancer therapy
Alain Gerbaulet-Legaonach (Paris, France)

8.00 p.m. Dinner

Friday, 29th November 2013

7.30 a.m. – 8.30 a.m. **Breakfast**

SESSION I: FUTURE OF MODERN BRACHYTHERAPY – WHERE ARE WE GOING?
CHAIRMANS: PIERRE SCALLIET, ALAIN GERBAULET-LEGAONACH, JANUSZ SKOWRONEK

8.30 a.m. – 8.55 a.m. Is brachytherapy a giant or a slave in combined therapy of cancer?
Bogusław Maciejewski (Gliwice, Poland)
8.55 a.m. – 9.20 a.m. Interventional Radiation Oncology – do taboos still exist?
Nicolas Zamboglou (Offenbach am Main, Germany)
9.20 a.m. – 9.45 a.m. Results, complications, quality of life, costs? What else matters?
Janusz Skowronek (Poznań, Poland)
9.45 a.m. – 10.10 a.m. Can we deliver the dose distribution we plan in intensity modulated HDR brachytherapy?
Dimos Baltas (Offenbach am Main,Gernany)
10.10 a.m. – 10.30 a.m. Panel discussion
Moderator: Janusz Skowronek
Panelists: Bogusław Maciejewski, Nicolas Zamboglou, Pierre Scalliet, Alain Gerbaulet-Legaonach, Dimos Baltas

10.30 a.m. – 11.00 a.m. **Coffee Break**

SESSION II: BRACHYTHERAPY IN GYNECOLOGY – MODERN IMAGING AS A MILESTONE
CHAIRMANS: JAROSŁAW ŁYCZEK, CHRISTIAN KIRISITS, BARBARA SEGEDIN

11.00 a.m. – 11.25 a.m. From research to daily clinical practice for gynaecological brachytherapy
Christian Kirisits (Vienna, Austria)
11.25 a.m. – 11.50 a.m. Challenges in image guided adaptive brachytherapy of gynecological malignancies
Barbara Segedin (Ljubljana, Slovenia)
11.50 a.m. – 12.05 p.m. Where are we going? The Gliwice way from 2D to 3D image guided brachytherapy in cervical cancer
Brygida Białas (Gliwice, Poland)
12.05 p.m. – 12.20 p.m. Brachytherapy in patients with endometrial cancer not eligible for surgery
Małgorzata Klimek (Kraków, Poland)

12.20 p.m. – 12.35 p.m. Hyperthermia in brachytherapy of gynecological cancer
Norbert Piotrkowicz (Otwock, Poland)
12.35 p.m. – 1.00 p.m. Panel discussion
Moderator: Jarosław Łyczek
Panelists: Christian Kirisits, Barbara Segedin, Brygida Białas, Małgorzata Klimek, Norbert Piotrkowicz

1.00 p.m. – 2.30 p.m. **Lunch**

SESSION III: PROSTATE CANCER – CHALLENGES FOR BRACHYTHERAPY
CHAIRMANS: BRYGIDA BIAŁAS, NICOLAS ZAMBOGLOU, FERRAN GUEDEA

2.30 p.m. – 2.55 p.m. The role of brachytherapy in prostate cancer
Ferran Guedea (Barcelona, Spain)
2.55 p.m. – 3.20 p.m. LDR or HDR brachytherapy – battle of the Titans
Janusz Skowronek (Poznań, Poland)
3.20 p.m. – 3.45 p.m. Brachytherapy of prostate cancer recurrences
Jarosław Łyczek (Brzozów, Poland)
3.45 p.m. – 4.10 p.m. HDR monotherapy in treatment of prostate cancer – do we have a standard?
Tomasz Filipowski (Białystok, Poland)
4.10 p.m. – 4.17 p.m. Proffered paper I – A prospective phase II study of salvage brachytherapy in combination with interstitial hyperthermia for locally recurrent prostate carcinoma following external beam radiation therapy
Andrzej Kukiełka, Vratislav Strnad (Kraków, Poland; Erlangen, Germany)
4.17 p.m. – 4.23 p.m. Proffered paper II – High-Dose-Rate brachytherapy as salvage reirradiation for recurrent prostate cancer patients
Piotr Wojcieszek, Marek Fijałkowski, Sylwia Kellas-Ślęczka, Brygida Białas (Gliwice, Poland)
4.23 p.m. – 4.30 p.m. Proffered paper III – Comparison of Day 0 Ultrasound real-time dosimetry with Day 0 and Day 30 CT-based dosimetry for permanent prostate implants using 125I single seeds
Anysja Zuchora, Louise Fahy, Jamsari Khalid, Frank Sullivan, Peter Woulfe, Claire Dooley (Galway, Ireland)

4.30 p.m. – 5.00 p.m. **Coffee Break**

SESSION IV: BREAST CANCER BRACHYTHERAPY IN FIRE OF COMPETITION
CHAIRMANS: JACEK FIJUTH, VRATISLAV STRNAD, CSABA POLGAR

5.00 p.m. – 5.25 p.m. Update on prospective APBI clinical trials
Csaba Polgar (Budapest, Hungary)
5.25 p.m. – 5.50 p.m. Brachytherapy for Partial Breast Irradiation – FACTS & MYTHS
Vratislav Strnad (Erlangen, Germany)
5.50 p.m. – 6.10 p.m. GEC-ESTRO recommendations
Jarosław Łyczek (Brzozów, Poland)
6.10 p.m. – 6.25 p.m. Balloon and hybrid applicators in Polish reality
Dorota Kazberuk (Białystok, Poland)
6.25 p.m. – 6.40 p.m. Brachytherapy as a boost – an effective alternative
Anna Kulik (Warszawa, Poland)
6.40 p.m. – 6.47 p.m. Proffered paper IV – Local anaesthesia in Accelerated Partial Breast Irradiation
Piotr Wojcieszek, Marek Fijałkowski, Sylwia Kellas-Ślęczka, Brygida Białas (Gliwice, Poland)

8.00 p.m. **Social evening**

Saturday, 30th November 2013

7.30 a.m. – 8.30 a.m. **Breakfast**

SESSION V: TREATMENT PLANNING IN BRACHYTHERAPY – ON THE WAY TO PERFECTION
CHAIRMANS: GRZEGORZ ZWIERZCHOWSKI, TOMASZ FILIPOWSKI

9.00 a.m. – 9.20 a.m. Modern methods of optimization of dose distributions and the routine use of 3D imaging methods
Grzegorz Zwierzchowski (Poznań, Poland)

9.20 a.m. – 9.40 a.m. Dose calculation for photon-emitting brachytherapy sources with average energy higher than 50 keV: Report of the AAPM and ESTRO
Renata Kabacińska (Bydgoszcz, Poland)

9.40 a.m. – 10.00 a.m. Radiobiology of prostate cancer
Maria Kawczyńska (Warszawa, Poland)

10.00 a.m. – 10.15 a.m. Comparison of the physical properties of Co-60 and Ir-192 sources – return of cobalt?
Łukasz Kowalik (Brzozów, Poland)

10.15 a.m. – 10.30 a.m. Brachytherapy dose distributions – what awaits us after the TG-43?
Grzegorz Bielęda (Poznań, Poland)

10.30 a.m. – 11.00 a.m. Panel discussion
Moderator: Grzegorz Zwierzchowski
Panelists: Renata Kabacińska, Maria Kawczyńska, Łukasz Kowalik, Grzegorz Bielęda

11.00 a.m. –11.30 a.m. **Coffee Break**

11.00 a.m. – 11.30 a.m. **Polish Brachytherapy Society Meeting**

SESSION VI: RADICAL OR PALLIATIVE TREATMENT – DIFFICULT CHOICES
CHAIRMANS: JANUSZ SKOWRONEK, BRYGIDA BIAŁAS

11.30 a.m. – 11.50 a.m. Interstitial Brachytherapy in Head & Neck Cancer. Techniques, Indications and Contemporary Results
Adam Chicheł (Poznań, Poland)

11.50 a.m. – 12.10 p.m. Lung cancer brachytherapy – 3D planning and its benefits in palliative care
Damian Kazalski (Brzozów, Poland)

12.10 p.m. – 12.30 p.m. Palliative brachytherapy of lung and esophageal cancer
Andrzej Lebioda (Bydgoszcz, Poland)

12.30 p.m. – 12.45 p.m. Anesthetic nursing care in brachytherapy laboratory of Bialystok Oncology Center
Dariusz Kożuchowski, Elżbieta Sznajderuk (Białystok, Poland)

12.45 p.m. – 1.00 p.m. Patient care after brachytherapy for prostate cancer
Maria Norberciak (Poznań, Poland)

1.00 p.m. **Congress remarks**

Opening lecture

Quality in radiotherapy, a never ending story

Pierre Scalliet

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Abstract

Setting up quality objectives in radiotherapy is relatively straightforward: every European patient has the right to receive state-of-the art therapy appropriate to his or her health condition. This implies a succession of tests and procedures for diagnosis and treatment indication: medical and family history, image quality, quality of pathological report, appropriate staging, adherence to evidence-based guidelines for radiotherapy indication and its integration in a comprehensive treatment plan. This should be understood with the necessary flexibility to adapt to individual situations, since about 30% of patients do not "fit" into guidelines for various reasons (age, co-morbidities, socio-economic factors, etc.).

Once the indication has been confirmed, the patient will enter in a long and delicate procedure that includes proper identification, fixation and simulation, adequate volume contouring, beam arrangement and dose distribution and, last but not least, reproducible treatment delivery. Quality checks, technical as well as procedural, are needed at all stage to ensure that all planned steps do not deviate from intended action. The sum of these tests constitutes a *quality assurance program* (ESTRO 1995). Its management is usually in the hands of a *quality officer* whose departmental function is to develop and maintain a comprehensive approach to quality radiotherapy. Quality has three important aspects: treatment outcome, infrastructure (staff and equipment) and treatment procedure. All 3 elements are parts of the comprehensive *quality management system* of the department.

Even in the most organized department, and much more in the least, misadministration of radiotherapy is a permanent danger, whose occurrence is promoted by the addition of small failures and violations. A precise registration of these events is an invaluable source for quality maintenance: identification of obsolete or inappropriate procedures, feed back on the stress and competence level of operators, equipment malfunctions, etc… The pioneering work in incident management belongs to ROSIS (Radiation Oncology Safety Information System). Incident registration and analysis, together with prospective analysis of failure modes may be regarded as the finishing touch to a fully developed quality system. Many departments in Europe already function with a comprehensive quality management system. Their experience is progressively transmitted to others, in and out of Europe through the extensive audit program of IAEA (QUATRO program).

What will be the next steps?

In the first place, regular audits should be organised to maintain the high level of quality already achieved. External audits are efficient ways to offer an independent view on a departmental system. It exercises some pressure at the right point to motivate the pursuit of quality at all time. Indeed, quality is not a goal to achieve; it is a way to be. As part of a comprehensive approach to quality assurance in the treatment of cancer by radiation, an independent external audit (peer review) is important to ensure adequate quality of practice and delivery of treatment [1]. Historically, clinical audits in radiotherapy have been promoted by IAEA, after the development of a specific methodology in which ESTRO members played an active role. It is available on the IAEA website under the name QUATRO (quality assurance team for radiation oncology). To capture the actual level of competence of a department, the audit addresses simultaneously the issues of equipment, infrastructure and operation of clinical practice. A major part of the audit is patient oriented. It is carried out by experts in the 3 main disciplines: RTT, medical physics and radiation oncology.

A clinical audit is not a pass or fail test; it is a process by which a comprehensive quality management system is measured against pre-defined standards or codes of good practice. Its result is a series of recommendations that could fall in 3 categories: (1) urgent corrective actions needed (with or without consecutive re-audit), (2) corrective actions to be implemented in the future without urgent need, and (3) no specific recommendations. The latter category implies that the department runs at an appropriate level of quality and safety. This does not mean that quality and safety have been achieved, as both should be permanently developed and updated, but that the department has a dynamic and organised management system that constantly checks upon their appropriateness. An appropriate management system is a system with an organised forward and backward quality and safety monitoring, a system that learns from its mistakes (implying that mistakes are actively recorded and analysed), and a system reactive to innovation (proactive safety management through FMEA). *Indeed, quality is not a goal, quality is a way.*

Well over 50 hospitals have been already audited in Europe (Central and Eastern) and, in some countries, the clinical audits have become a legal requirement. More recently, Belgium, through its Federal College of Radiotherapy, has started a program for systematic auditing of radiotherapy departments, drawing upon the IAEA experience and with the help of some of its experts. Ten hospitals have already been audited (out of 25) and results will be presented at the conference. More than a challenge, radiotherapy departments should "infect" their departmental partners with the same comprehensive approach to quality (surgery, medical oncology, etc.). The objective, in fact, is to offer not only state-of-the-art radiotherapy to cancer patients, but state-of-the-art comprehensive oncological care.

Key words: quality assurance, QUATRO, radiotherapy.

References

1. Comprehensive Audits of Radiotherapy Practice: a Tool for Quality Improvement. IAEA, Vienna 2007; available at: http://www.iaea.org/books.

Role of brachytherapy in child cancer therapy

Alain Gerbaulet-LeGaonach

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Abstract

Purpose: Knowing the specific qualities of brachytherapy in adult cancer patients, the question is: is it possible to use brachytherapy for paediatric malignancies? Few indications of brachytherapy are proposed, because of chemo-sensitivity in child cancers, important progress in EBI. The growing normal tissue in a child is very radiosensitive, so post irradiation sequel remain a difficult problem to solve. The Institut Gustave Roussy's experience concerns more than 200 patients representing the largest number of child cancers treated in the same institute. This population (excluding retinoblastoma and brain tumors) is divided in 2 groups: a) RMS, YST; b) CCA. Treatments are: a) chemotherapy + conservative surgery + brachytherapy +/-EBI; b) conservative surgery + brachytherapy +/-EBI. For interstitial brachytherapy, the great majority of patients received LDR brachytherapy using often plastic tubes technique, and iridium wires; for endocavitary brachytherapy, personalized mould applicator loaded with iridium wires or caesium sources allowing the use of a remote after loading projector. Different technical examples are widely illustrated according to the tumor sites, followed by results (respectively OS, LC, Cpl rates for each group). First group: HAN 39 pts, median age 5.1 yrs (OS 77%, LC 81%, Cpl 33%), trunk-limbs 13 patients, in 10 cases salvage brachytherapy (OS 60%, LC 65%, Cpl 22%), bladder-prostate 67 patients, median age 4.9 yrs (OS 82%, LC 92%, Cpl 30%); gynaecology 39 patients, median age 1.4 yrs, tumor sites vagina 26, vulva 6, vagina-vulva 7 (OS 82%, LC 92%, Cpl 30%); for the 2nd group CCA cervix-vagina OS 80%, LC 83%,Cpl 35%).

The AMORE protocol (Bradley Pieters) will be also summarized (*A*blation, *MO*uld, *RE*construction). Literature data: One table including literature data according to the different brachytherapy procedures is compared with one other table which summarizes the IGR's results.

Conclusions: If we take into account literature results and our own experience, brachytherapy can play a role in child cancer therapy obtaining a DFS of 70-75%, a local control of 80-85%, with 20-30% of Gr 2-3 complication rate. But, as always in oncology, brachytherapy must be integrated in a very multidisciplinary approach to perfectly select its indications. Very sophisticated techniques are used, and reserved to teams with specific and extensive experience.

Key words: brachytherapy, child cancer, paediatric malignancies.

ORAL PRESENTATIONS

Session I

Future of modern brachytherapy – where are we going?

Is brachytherapy a giant or a slave in combined therapy for cancer ?

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Abstract

The power of brachytherapy (BRT) is confronted with various 3D, and 4D techniques of external radiotherapy (ERT). BRT allows to deliver conformal dose restricted to the target with a steep dose gradient beyond this region. However, with decrease in the dose rate, biological effective dose also significantly decreases. BRT-HDR is similar to hypofractionated ERT, mainly for tumours with a low α/β. According to the result studies, a number of such tumours increases. Importance of BRT as a boost treatment, and its biological rationale are presented and discussed. For H&N tumours, BRT-boost with a total equivalent BED of about 110-120 $isoGy_{20}$ leads to about 10-20% increase in 5 yr LRC. On the other hand, many well known centers have documented excellent 5 yr BNED (≥ 90%) for prostate cancer if Mono-Hypo-BRT with 4 x 9 Gy to 6 x 7 Gy were applied. Moreover, the overall costs of BRT are about at least 1.5 times less expensive than ERT. It seams the BRT is neither a slave or a giant, but with no doubt plays an important part of combined therapy for many solid tumours.

Key words: BED, brachytherapy, cancer.

Results, complications, quality of life, costs? What else matters?

Janusz Skowronek

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Abstract

This year marks the 100 years since the first application of radium brachytherapy in treatment of cancer. During this period, this technique has undergone various stages of development – from the treatment of skin cancer and gynecological tumors, dependent on the availability of cancer, technical capabilities, properties of radioactive isotopes – to use in almost any location of the tumor, using modern afterloading systems, and 3D treatment planning systems. Brachytherapy place in the treatment of cancer is constantly evolving, and is often dependent from non-medical factors. The first of these factors is the availability of the method dependent on the level of reimbursement, the quality of the health care system. A slight change in the name of the refund procedure can reduce brachytherapy treatments. Expensive techniques are chosen without considering the benefits to the patient or to the whole group of patients. Competitive groups are interested. The second factor – principles of cancer treatment accepted by the country (region), and attitude of doctors to practice and its acceptance. Sometimes, a graduate of a medical school does not recognize the word – 'brachytherapy'. Too often, other than medical factors decide about the development of brachytherapy. A noticeable trend is skipping and conducting meta-analysis, comparing different techniques of treatment. Doctors who use one technique does not pay attention to other methods or try to ignore them. Treatment results are not analyzed in terms of the 'golden' rule – treat as many patients as possible in the available situation. Another factor that slowly (very slowly) influence the choice of treatment technique is the Quality of Life after the end of treatment. These questions are an attempt to study the feasibility of the development of brachytherapy in a world where the choice of treatment method depends increasingly from other than medical reasons.

Key words: brachytherapy, complications, costs, radiotherapy, results.

Session II

Brachytherapy in gynecology – modern imaging as a milestone

From research to daily clinical practice for gynaecological brachytherapy

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Abstract

Shortly after computer tomography was introduced into radiotherapy, the first scientific papers showed the possibility to use CT images for treatment planning in gynaecological brachytherapy. More than 20 years ago, the earliest publications described the use of MR imaging showing the relation of the implanted applicators to the anatomy. However, it took many years until CT/MRI intracavitary applicators became commercially available, and the treatment planning systems could directly import and process 3D volumetric images. Since then, hundreds of publications presented methods, and results related to modern gynaecological brachytherapy. However, the full transition from simple radiography based planning to 3D volumetric planning into clinical practice took, and still takes a very long time compared to the successful integration of 3D conformal, IMRT, IGRT or prostate brachytherapy. The combination of a comprehensive clinical examination with MRI shows very promising results for local control. The dose distribution can be optimized to an adaptive target concept, which is related to the situation at time of an individual brachytherapy fraction. If MRI is not feasible at time of brachytherapy or for each fraction several solutions have been proposed to combine MRI, CT and clinical examination. Interfraction variations depend on clinical protocols (organ filling, fixing the applicator with appropriate packing, timepoint of brachytherapy, etc.). Three main issues seem to be important: 1) A clear and reproducible target definition, taking into account all clinical and radiological information available. 2) A standardized set of dose and volume parameters to define planning aims, and perform reproducible treatment prescription. Constraints for these parameters are currently established to optimize the prescription with dose-response correlations for target and OARs, and adapted to the individual patient. 3) Careful dose shaping taking into account dose and volume parameters, but also the spatial dose distribution plus optimization of the implant geometry itself. While good responding or small tumours can be treated sufficiently with intracavitary alone, additional interstitial applicators seem to be essential for large tumours. A review of experiences reported so far provides a priority list for the most important issues based on clinical evidence.

Key words: 3D imaging, brachytherapy, gynaecological cancers.

Challenges in image guided adaptive brachytherapy of gynaecological malignancies

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Abstract

Image guided adaptive brachytherapy (IGABT) is an essential part of locally advanced cervical and vaginal cancer treatment. Although the implementation of GEC ESTRO target concept is on the rise, many centres still practice BT using plain radiographs, and prescribing dose to point A, as sectional imaging availability is still a problem. IGABT target concept takes into account tumour extension at time of BT (HRCTV) as well as at time of diagnosis (IRCTV), so accurate interpretation of MR images is crucial for application planning. Analysis of retrospective data in retroEMBRACE study showed that local control can be achieved in 95% of patients with locally advanced cervical cancer if D_{90} for HRCTV > 92 Gy. To obtain this dose, implantation of interstitial needles is necessary in many cases. Making the right choice of applicator and performing a good application takes a lot of training. On line image guidance with ultrasound or MR can be helpful in difficult cases, not only in accurate applicator positioning, but also in avoiding possible complications. With the implementation of GEC ESTRO guidelines for imaging, the target definition and applicator reconstruction, uncertainties in target volume and organs at risk (OAR) delineation represent a major cause for possible target under dosage, unreliable reporting, higher complication rates, and, possibly, lower local control rates. Uncertainties in target contouring can be reduced with the use of good imaging techniques, reproducible imaging protocols, implementation of contouring guidelines, and training. While the new target concept and use of interstitial needles allow for dose optimisation, conforming prescribed dose to the target volume and reducing dose to OAR, one needs to take care not to conform too tight, while respecting dose constraints to OAR, especially taking into account possible contouring uncertainties. With improvement in local control using IGABT, regional and metastatic disease become a major subject of future research.

Key words: cervical cancer, image guided adaptive brachytherapy, vaginal cancer.

Where are we going? The Gliwice way from 2D to 3D image guided brachytherapy in cervical cancer

B. Białas, S. Kellas-Ślęczka, M. Szlag, A. Cholewka, R. Tarnawski, K. Raczek-Zwierzycka, P. Wojcieszek, M. Fijałkowski

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Abstract

The use of brachytherapy in the treatment in cervical cancer is essential, and while the development of EBRT has advanced in recent years, the use of brachytherapy had not progressed in the same way. The standard technique consists of standard doses prescribed to a fixed point, and the use of plain X-ray imaging for treatment planning. However, during the last few years, concepts for 3D image based treatment planning in cervix cancer BT have been developed. New CT and MRI compatible high-dose-rate applicators, and improvement in imaging techniques has allowed to move form 2D to 3D IGBT. In 2005, GEC-ESTRO published recommendations for the use of IGBT for cervical cancer. The guidelines have subsequently been endorsed by both GEC-ESTRO and ABS as the new international standard for cervix cancer BT. In Gliwice Cancer Center HDR-BT has been performed in cervical cancer for 30 years. We have started with traditional 2D X-ray-based treatment planning with our own dosimetry system, fractionation scheme and shielding applicators. We have used CBCT for treatment planning and plan evaluation since 2008, CT/MRI since 2011. In the same year, IMRT technique for EBRT planning has been introduced. We described process of movement from 2D to 3D treatment planning in our brachytherapy department, our experience with CBCT, and CT/MRI treatment planning for fractionated HDR brachytherapy in cervical cancer according to GEC-ESTRO recommendations. All patients undergo five intracavitary HDR-BT. Before every treatment, a CBCT and MRI image set is acquired with CT/MRI compatible ring applicator. The external contours of applicator, organs at risk and tumor are delineated on each CT and MRI slice in the 3D treatment planning system. The fusion of CT and MRI is performed. In our experience, IGBT procedure is feasible and convenient in cervical cancer treatment, even at a busy brachytherapy department.

Key words: 3D, brachytherapy, cervical cancer, image guided brachytherapy.

High-dose-rate brachytherapy in patients with medically inoperable endometrial carcinoma

Małgorzata Klimek[1], Anna Dziedzichowicz[2], Eleonora Góra[2], Krzysztof Urbański[1]

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Abstract

Total abdominal hysterectomy, and bilateral salpingo-oophrectomy (TAH-BSO) with or without pelvic lymphadenectomy is the standard approach in the treatment of early-stage endometrial carcinoma. However, for patients of advanced age or with severe comorbidities, surgery may be contraindicated. Under such conditions, for patients with stage I endometrial cancer, and infiltration limited to the mucosa brachytherapy may represents the curable option. Recently, computed tomography (CT), and magnetic resonance imaging (MRI) have increasingly been used for treatment planning of HDR brachytherapy. However, at the same time, a lot of patients are still treated based on 2D planning systems. About 40-50% of centres providing brachytherapy in Poland use X-ray imaging as standard for gynecological tumors treatment planning. This study aims to assess the efficacy, and toxicity of brachytherapy in the group of 10 medically inoperable patients with endometrial carcinoma stage I limited to the mucosa. Additional group of patients concerned 3 women for whom HDR brachytherapy was a palliative treatment, and 2 for whom brachytherapy was a part of combined therapy. The duration of follow-up ranged from 6-12 months. All patients were treated with HDR intracavitary Rotte 'Y' applicator brachytherapy, based on orthogonal radiography-based planning. We performed 2D treatment planning, because the 3D treatment planning system was not available at that time. The dose was prescribed to uterine points located 2 cm below the center of a line drawn between two channels of the Rotte applicator, and to points A. The prescribed dose ranged from 28 to 32Gy given in 4-6 fractions once a week. Mean, minimal percentage of dose prescribed to specified uterine points ranged from 82.4 to 92.9, and maximal from 102 to 107.5. Tolerance of brachytherapy was good. In all patients with infiltration limited to mucosa abrasion performed 6 weeks after brachytherapy showed no active cancer.

Key words: endometrial carcinoma, HDR brachytherapy, Rotte applicator.

Hyperthermia in gynecological brachytherapy

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Abstract

Hyperthermia has had a proven biological efficacy. Unfortunately, after over 100 years of promising clinical experience with this modality, it still has a very limited impact on common practice in oncology. Hyperthermia in conjunction with radiotherapy, offers better clinical results and less complication rate. Several studies have shown both: time and temperature dependence of hyperthermia treatment outcome. Considering the fact mentioned above, the addition of hyperthermia should have the most expressed effect when it is combined with brachytherapy. This approach allows achieving the maximum temperature level within the best healthy tissue spare. There is a very limited published data regarding this issue. Gynecological cancers seem to be one of the best fields to show the effectiveness of hyperthermia-brachytherapy combination. Temperature elevation could be obtained in different ways, according to the kind of applicators used for brachytherapy. Radio-frequency generally requires metal applicators, whereas microwaves and ultrasound – non-metallic ones. Probably, the simplest way to proceed would be to use the same applicators for both modalities. What is even more practical and effective is the simultaneous use of heating and radiation. This practically excludes ultrasounds as the source of temperature elevation, and makes the combination of radio-frequency and metal applicators (preferably interstitial needles) the perfect choice. The heating procedure could be the generator while planning HDR treatment, elevating the total treatment time to no more than 15-30 minutes. There is a strong need of multi-institutional standardized study in placing hyperthermia as a standard in gynecological brachytherapy.

Key words: brachytherapy, gynecological cancers, hyperthermia.

Session III

Prostate cancer – challenges for brachytherapy

The role of brachytherapy in prostate cancer

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Abstract

Purpose: At present, the three primary treatment modalities for prostate cancer are surgery (prostatectomy), external beam radiotherapy (EBRT), and brachytherapy (BT). Depending on the tumour stage, patient characteristics and preferences, all three are viable options. Brachytherapy is widely used as a primary treatment in clinically localized PCa, and as an adjuvant treatment following surgery or EBT in locally advanced PCa. This technique offers numerous advantages including the ability to deliver highly conformal doses while sparing surrounding healthy tissue, minimal adverse effects, excellent survival, and high quality of life post-treatment. Compared to EBRT, BT has the added advantages of reduced treatment times, less acute toxicity, and fewer concerns over issues such a treatment setup uncertainty and organ motion. At the Catalan Institute of Oncology, we have offer both high-dose rate (HDR) BT and permanent prostate brachytherapy (PPB). Recently, we assessed our long-term outcomes with both procedures.

HDR BT as a boost after EBRT: The standard approach to intermediate and high-risk locally advanced prostate cancer is EBRT with or without androgen suppression therapy (AST). In recent years, multiple studies have found that results can be improved through dose escalation, and HDR-BT is one of the preferred methods to escalate the dose without excessively increasing late genitourinary (GU) and gastrointestinal (GI) toxicity. The most common treatment schedule is 45 Gy delivered by an EBRT approach followed by 2 fractions of HDR-BT. However, this schedule is highly variable due to the lack of a generally-accepted standard. At our centre, we use 60 Gy EBRT plus a single fraction boost of 9 Gy HDR BT. Compared to EBRT alone, dose escalation with the BT boost technique improves outcomes and reduces toxicity, because a higher biologically-equivalent dose (BED) can be delivered to the tumour while the rectum and bladder are spared. We have been using this atypical approach successfully since 2002 for all high-risk (and selected intermediate-risk) prostate cancer patients. We reported early results of our experience in the year 2010, and we have recently reviewed our long-term experience in a large series of patients (377), with excellent results: 5- and 7-year biochemical relapse-free survival rates were 91% and 89%, respectively. These clinical outcomes are similar to those reported in other large studies with a long follow up, with the additional advantage of requiring only a single fraction boost.

Permanent prostate brachytherapy: Permanent prostate brachytherapy (PPB), also known as low-dose rate (LDR) BT, is considered a definitive treatment option in men with clinically localized prostate cancer, and biochemical control rates achieved with this technique are similar to radical prostatectomy or EBRT. Contemporary transperineal PPB, carried out with templates and ultrasound image-guidance, offer excellent long term results with minimal toxicity. The rapid fall-off in dose over a distance of a few millimetres, spares the surrounding structures but unfortunately may result in uncertain coverage of the immediate periprostatic tissue. Because of the inconsistent treatment margins, LDR BT is most often used for low-risk prostate cancer, or, if used for intermediate or high-risk disease, it is combined with EBRT to provide coverage of potential extra-capsular disease. Recently, we retrospectively reviewed 5- and 10-year overall survival (OS), and biochemical-relapse free survival (BRFS) in 700 patients diagnosed with low- and intermediate-risk clinically-localized prostate cancer treated with primary PPB between January 2000 and July 2012. At a median follow-up of 63 months, OS and BRFS at 5-years were 94% and 95%, respectively, and 85% and 84% at 10-years. Importantly, this is one of the largest samples ever reported.

Conclusions: As our recent data confirms, both HDR BT and LDR BT have an important role to play in the treatment of prostate cancer. Both techniques provide excellent tumour control and long-term outcomes with acceptable early and late toxicity.

Key words: brachytherapy, HDR, LDR, prostate cancer, seeds.

LDR or HDR brachytherapy – battle of the Titans

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Abstract

Purpose: Permanent LDR brachytherapy and temporary HDR brachytherapy are competitive techniques for clinically localised prostate radiotherapy. Although, a randomized trial will likely never be conducted comparing these two forms of brachytherapy, a comparative analysis

proves useful in understanding some of their intrinsic differences, several of which could be exploited to improve outcomes.

Material and methods: There are main goals of prostate cancer treatment: cancer control; preservation of urinary control (continence); preservation of sexual function (potency). Indications for monotherapy (based on ABS, ASTRO, GEC-ESTRO recommendations), for brachytherapy as a boost to EBRT, and other possible indications are discussed. Contra-indications based on ESTRO/EAU/EORTC recommendations and common side effects (short-term, long-term) are presented. Advantages and disadvantages of both methods are discussed. It is noted that similar clinical results to surgery and EBRT are observed in both brachytherapy techniques. Both techniques are also compared from a technical point of view; costs are also analysed.

Results: Each of these techniques has attributes that has created advocates for one or the other. First, they represent the extreme ends of the spectrum with respect to dose rate and fractionation, and therefore have inherently different radiobiological properties. LDR brachytherapy has the great advantage of being practically a one-time procedure, and enjoys a long-term follow-up database supporting its excellent outcomes and low morbidity. On the other hand, HDR is a fairly invasive procedure requiring several sessions associated with a brief hospital stay. Although lacking in significant long-term data, it possesses the technical advantage of control over its postimplant dosimetry (by modulating the source dwell time and position), which is absent in LDR brachytherapy. This important difference in dosimetric control allows HDR doses to be escalated safely, a flexibility that does not exist in LDR brachytherapy.

Conclusions: For the radiation treatment of prostate cancer, a high dose should be delivered for optimal biochemical control. Radiobiological models support the current clinical evidence for equivalent outcomes in localised prostate cancer with either LDR or HDR brachytherapy using current dose regimens. At present, the available clinical data with these two techniques suggest that they are equally effective, stage for stage, in providing high tumour control rates.

Key words: HDR brachytherapy, LDR brachytherapy, prostate cancer, seeds.

HDR brachytherapy in the treatment of recurrent locally advanced prostate cancer

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Abstract

From the last decade of 20th century, the number of new detected prostate cancer cases grow very rapidly. In Poland from that time, the number of new cases increased from 2000 to almost 7000 patients a year. Because of screening programs based on PSA and DRE examinations, bigger number of patients has relatively lower the stage of disease. Lot of them has qualifications for radical treatment in any technique. Still in these group, 15-20% has recurrence of the disease during observation. Typically for these group, the next step was hormonotherapy or surgery (not so common because of early and late complication). Since 2000, in Poland we started the project of HDR brachytherapy for locally recurrence disease of the prostate cancer. Between 2000 and 2012, 187 patients with recurrent prostate cancer were treated by HDR brachytherapy. In all cases, the regime of 3 fractions, 10Gy every 21 days was obligatory. In all cases, different treatment regime was proposed and we exclude patients from the analyses. Primary and secondary PSA level, Gleason score, primary treatment, and time from primary treatment to relapse was analyzed. Also treatment volume was detected in the analyses. For the whole group, the mean time of observation was 76 months (from 12 to 144 months). 63% of analyzed patients were alive without any recurrent symptoms for more than 6 years. Gleason score, and time from primary treatment seems to be the strongest indication for secondary treatment. Patients primary treated by HDR or seeds are not good candidates for secondary HDR brachytherapy. The best group are the patients treated primary by external radiotherapy or patients were the distance between primary, and secondary treatment longer than 3 years. All the treatment regimes (surgery with external, external alone, external with brachytherapy boost and exclusive brachytherapy) will be analyze as well as the rest of the factors.

Key words: brachytherapy, HDR, prostate cancer, recurrence.

HDR monotherapy in treatment of prostate cancer – do we have the standard?

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Abstract

Clinical investigation showed that escalation of EBRT dose for organ-confined prostate cancer improves local disease control. High dose rate brachytherapy was initially used to supplement external beam radiotherapy. It was good and safe way to boost and escalate dose for organ without severe side effects. Radiobiological data show that ratio for prostate cancer is low. In the majority of articles, the ratio equals is 1.5 (1.2-3.0), indicating high sensitivity to increasing the fraction, and it is an effective way of achieving dose escalation, while actively shaping the dose distribution by accurately controlling the radiation source positioning and modulating source of dwell time. In the meantime, other investigators showed that morbidity of HDR monotherapy have less or the same side effects in comparison to EXRT or combined EXRT + HDR-BRT as boost. Moreover, the time of HDR brachytherapy treatment is shorter, and is more convenient for patients, who accept a minimally invasive procedure and that in general is associated with better preservation of erectactile function than surgery or external radiotherapy. In Poland, every year more and more patients are being diagnosed with prostate cancer. Thanks to PSA and growing consciousness, we have more patients with locally advanced tumor. In last ten years, many oncological hospitals with brachytherapy departments equipped in HDR machines, started to treat patients with prostate cancer by HDR protocol. But even if we use the same formula (BED = nd (1+ d/α/β/) and α/β ratio, we are operating on another schema treatment that differ in: dose per fraction (8-15), total dose (30-45), time between the fraction (7-21 days), and number of fraction (2-4). It is of course word wide trend as we are looking for gold standard. The problem is a long time follow-up observation of overall survival in prostate cancer. A treatment with use HDR machine is relatively young method. We need more time to observe our patients, and look for our results. In the philosophy of treatment, in theoretical and practical, we can say YES – we achieved the standard. Moreover, this way of treatment is refunded by National Health Found (NFZ) as a catalogue standard method. But when we take the definition of the standard of care as: *a medical or psychological treatment guideline can be general or specific. It specifies appropriate treatment based on scientific evidence, and collaboration between medical and/or psychological professionals involved in the treatment of a given condition.*

The differences in doses, numbers of fraction and time of treatment, I have no objectives doubts and rather say NO.

Key words: brachytherapy, HDR monotherapy, prostate cancer.

A prospective phase II study of salvage brachytherapy in combination with interstitial hyperthermia for locally recurrent prostate carcinoma following external beam radiation therapy

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Abstract

BT is the reasonable options for locally recurrent prostate cancer after previous EBRT with acceptable level of GU, and GI toxicity. Preclinical studies showed that hyperthermia has a potential to enhance the radiation efficiency by a factor of 1.4-2.0. Interstitial hyperthermia can be delivered using the catheters implanted during prostate BT procedure. In this trial, the dose prescribed to PTV will be 30 Gy in 3 fractions for HDRBT, and 60 Gy in 2 fractions for PDRBT. Peripheral prostate zone will be heated to 40-43°C for 60 minutes prior to BT dose delivery. The primary objectives of the trial are to estimate the rate of late Grade ≥ 3 GI, and GU toxicities related to combined salvage treatment cancer, and to determine time to biochemical failure (Phoenix definition). The main eligibility criteria are biopsy-confirmed locally recurrent prostate adenocarcinoma, initial EBRT completed > 24 months prior to biopsy, T1b-T3bN0/pN0M0, PSA-DT > 6 months.

Key words: HDR brachytherapy, prostate cancer, recurrence, salvage.

Local anaesthesia in accelerated partial breast irradiation

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Abstract

Purpose: Accelerated partial breast implantation (APBI) becomes important adjuvant modality for early breast cancer patients. Due to age, many women have increased risk of complications during general anaesthesia. This study aimed on quality of local anaesthesia during multicatheter implantation procedure.

Material and methods: 85 consecutive APBI patients filled anonymously the anaesthesia quality questionnaire (AQQ). Pain intensity was evaluated in 10 points scale.

Results: Every AQQ was valid, however, there were information lacking in several questionnaires. Median score on pain scale after the catheter implantation was 2 points (range 0-8). 45 women suggested that the most painful procedure was breast skin anesthetization. 70 women gave maximum of 10 points, when asked to evaluate APBI on last day. Median score was 10 points (range: 7-10). All of the patients did not regret they chose APBI BT. Moreover, they would recommend it to their friends. In univariate analysis fear of pain strongly correlated with pain during implantation (HR: 7.5; $p = 0.000$). Also APBI anxiety was linked to pain during procedure (HR: 2.96; $p = 0.007$).

Conclusions: Local anaesthesia for multicatheter implantation in APBI patients is a good alternative to general anaesthesia. Breast cancer patients were content of choosing this option of adjuvant treatment.

Key words: APBI, breast cancer, local anaesthesia.

Comparison of Day-0 Ultrasound real-time dosimetry with Day 0 and Day 30 CT-based dosimetry for permanent prostate implants using ^{125}I single seeds

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Abstract

Purpose: Day 30 CT-based dosimetry is the gold standard for final verification of prostate permanent implantation quality. This study will investigate whether clinically significant changes in the dose to the prostate, and critical adjacent structures occur between Day 0 (CT-0) and 30 (CT-30). This is achieved using CT-based dosimetry. Differences between Day-0 Ultrasound (US-I), and CT-0 are also analysed.

Material and methods: Dosimetry for 70 patients with permanent prostate implants using ^{125}I seeds was evaluated using intraoperative US Day 0, CT imaging Day 0 and Day 30. The dose received by 90% of the target volume (prostate D_{90}), percentage of volume receiving 100%, 150%, and 200% of prescribed dose (prostate V_{100}, V_{150}, V_{200}), urethra D_{30}, and D_{10}, and rectal V_{2cc} dose and prostate volume were analysed using Paired Student T-test. Differences were regarded as statistically significant at $p < 0.05$.

Results and Conclusions: Initial results show significant differences between the CT-0 and CT-30 dosimetric parameters analysed. D_{90}, V_{150}, and V_{200} prostate and V_{2cc} rectum mean values were higher for CT-30 than CT-0, and US-I. US-I and CT-0 urethral and rectal dosimetric parameters showed no significant differences. Early verification of dosimetric parameters using CT-0 is desirable as sub-standard implants can be identified. It is more convenient for the patient and allows verification of urethra dosimetry. Based on these initial results, CT-0 cannot replace CT-30 as the gold standard for final verification of prostate permanent implantation quality.

Key words: CT-based dosimetry, LDR brachytherapy, prostate cancer, seeds, ultrasound.

Session IV

Breast cancer brachytherapy in fire of competition

Update on prospective APBI clinical trials

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Abstract

Accelerated partial breast irradiation (APBI) is an attractive treatment alternative for whole-breast irradiation (WBI), which shortens the course of radiotherapy (RT) to less than a week. We review the results of studies using different brachytherapy (BT) and external beam RT techniques, and intraoperative RT (IORT). Seven early APBI studies had local recurrence (LR) rates of 6-37% yielding annual LR rates ranging from 1.4-6.2% with 50-83% of patients having excellent or good cosmetic results, reflecting suboptimal patient selection, target definition, and quality assurance procedures (Table 1).

Twelve more recent interstitial BT (iBT) studies performed using much more stringent approaches have had LR rates of 0-11% yielding annual LR rates ranging from 0-1.5% with 56-100% of patients having excellent or good cosmetic results (Table 2). The 10-year results of the Budapest phase III study suggested non-inferiority of APBI (vs. WBI) in local control, disease-free, cancer-specific, and overall survival. Furthermore, significantly better cosmetic outcome was achieved with iBT compared with the outcome after WBI. Preliminary results on early toxicities of the GEC-ESTRO multicentric phase III APBI trial suggested less skin side-effects after iBT vs. WBI. The 5-year local control after MammoSite BT, and 3D-CRT APBI are also encouraging (Table 2). However, concerns have been raised regarding the late toxicities of MammoSite BT and 3D-CRT as well. Preliminary results of the ELIOT, and TARGIT phase III IORT trials failed to demonstrate equivalence of IORT compared to WBI (Table 2). Long-term results of other ongoing phase III APBI trials (GEC-ESTRO, NSABP-B39/RTOG 0413, RAPID, IMPORT-LOW, Florence University) will address and refine issues of patient selection, target volume definition, total dose, and fractionation and hopefully support the implementation of APBI into the routine clinical practice.

Key words: APBI, brachytherapy, breast cancer.

Table 1. Results of early APBI studies

Institute	Study period	APBI technique	Patient No.	Median FUP (y)	Total LR%	Annual LR%
Christie Hospital*	1982-1987	ELE	353	8	20	2.5
Guy's Hospital I	1987-1988	LDR BT	27	6	37	6.2
Cookridge Hospital*	1986-1990	EBI	84	8	12	1.5
Guy's Hospital II	1990-1992	MDR BT	49	6.3	18	2.9
Uzsoki Hospital	1987-1992	MDR BT	70	12	24	2.0
University Florence I	1989-1993	LDR BT	115	4.2	6	1.4
London Reg. Ca. Cent.	1992-1996	HDR BT	39	7.6	15	1.97
All patients	1982-1996		737	4.2-12	6-37	1.4-6.2

**Randomized clinical trial*

Table 2. Results of contemporary APBI studies (with median FUP ≥ 4 years)

Institute	Study period	APBI technique	Patient No.	Median FUP (y)	Total LR%	Annual LR%
Interstitial BT series						
Oschner Clinic	1992-1993	LDR/HDR BT	51	6.25	2	0.32
WBH	1992-2001	LDR/HDR BT	199	10.7	5	0.47
Örebro Medical Center	1993-2003	PDR BT	51	7.2	5.9	0.82
HNIO Budapest I	1996-1998	HDR BT	45	13.8	11.1	0.80
RTOG 95-17	1997-2000	LDR/HDR BT	99	7	6.1	0.87
Tufts University	1997-2001	HDR BT	33	5.9	9.1	1.54
Harvard, Boston	1997-2001	LDR BT	50	11.2	12	1.07
HNIO Budapest II*	1998-2004	HDR BT/ELE	128	10.2	5.5	0.53
Ninewells Hospital	Before 1999	LDR BT	11	5.6	0	0
German-Austrian	2000-2005	PDR/HDR BT	274	5.2	2.9	0.56
University Navarra	2000-2007	HDR BT	26	4.4	3.8	0.86
Washington University	2002-2007	HDR BT	202	>5	2.5	0.50
All patients	1992-2007		1169	4.4-13.8	0-11.1	0-1.54
MammoSite BT series						
Registry trial	2000-2001	MammoSite BT	43	5.5	0	0
ASBS trial	2002-2004	MammoSite BT	1449	5.3	2.8	0.53
Kiel-Budapest	2002-2004	MammoSite BT	11	5	0	0
All patients	2000-2007		1503	5-5.5	0-2.8	0-0.53
3D-CRT series						
New York University	2000-2005	3D-CRT	98	5.3	1	0.19
WBH	2000-2011	3D-CRT	192	4.8	1.6	0.33
RTOG 0319	2003-2004	3D-CRT	52	4.5	5.8	1.29
Dana Farber/Harvard	2003-2005	3D-CRT/ IMRT	98	5.9	5.1	0.86
Rocky Mountain CC	2004-2007	3D-CRT	136	4.4	0.7	0.16
HNIO Budapest III	2006-2011	3D-CRT	44	4.5	2.3	0.51
All patients	2000-2011		620	4.4-5.9	0.7-5.8	0.16-1.29
IORT series						
ELIOT*	2000-2007	ELE	651	5	5.3	1.1
TARGIT*	2000-2009	50 KV photons	1679	2.4	> 3	> 1
Montpellier	2004-2007	ELE	42	6	9.5	1.58
All patients	2000-2009		2372	2.4-6	> 3-9.5	> 1-1.58

**Randomized clinical trial*

Brachytherapy for Accelerated Partial Breast Irradiation: FACTS & MYTHS

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Abstract

Purpose: To analyze the facts and myths surrounding Accelerated Partial Breast Irradiation (APBI) using adjuvant interstitial brachytherapy after breast conserving surgery in terms of clinical experience, quality assurance, clinical results, and patient acceptance.

Material and methods: The debates on brachytherapy for APBI are often charged with a lot of emotion – the situation can be summed up as follows: "He, who can does it. He, who cannot, combats it". It's evident, that brachytherapy is unique among the different techniques of APBI for a lot of reasons – a lot of FACTS *[1. Technique with the longest experience among all APBI techniques, 2. Variability, versatility, precision, 3. High Quality assurance and reproducibility, 4. No dependence on patient motions].* But often we have to discuss as well the MYTHS about brachytherapy for APBI *[1. Painful technique, scars remain, 2. Bad acceptance by patients, 3. Vast experience, and skill of the physician is necessary, 4. Patients in Europe don´t have any (travel) problem when utilizing external beam radiation therapy].* Both – as well the facts as the myths author analyses in a matter-of-fact and detailed fashion.

Results: The published data impressively demonstrate very long experience of brachytherapy as a technique for APBI. For instance, interstitial brachytherapy for breast cancer was started more than 45 years ago, the first Phase II APBI-trials were started more than 20 years ago, and over the same time, the rules of image-guided brachytherapy techniques for APBI have been developed. Also, the long-term results (10-12 year) of APBI using brachytherapy for selected patients with a published mean annual local recurrence rate of approximately 0.7% per year, compare favourably to trials with similar patient populations using whole breast irradiation (WBI), and reporting an annual recurrence rate of 0.9% advising that brachytherapy is at least equivalent. No other technique of APBI is supported by such robust and encouraging data. Comparing the dose distributions of different APBI techniques, and given the long-term experience and excellent clinical results, the high adaptability, versatility, precision, quality, and reproducibility of brachytherapy for APBI should be understandable to everyone. Addressing the reservations held by some patients and also by some physicians concerning pain, and the risk of scarring it quickly becomes obvious, that, thanks to the achievements of modern anaesthesia, and the fact that the liability to keloid formation is very low in European patients, these fears are mostly unfounded. The fear of "bad acceptance of brachytherapy by patients" is seen in a similar light. The current trends in the use of brachytherapy for APBI in the United Sates as well as in Europe – showing an exponential increase in utilization stand as facts against this fear and cannot be doubted. Also important demand of large experience, and skill of physician for brachytherapy is to judge making distinction. Of course, both experience and skill are necessary – as is true for every task perfomed by us as physicians! But it must be stated, that the technique of brachytherapy for breast cancer is one of the easier interstitial techniques, and it is not difficult to learn it. Finally, one of the most frequently repeated myths is: "our patients in Europe don't have any (travel) problem when it comes to whole breast irradiation". The fact is that starting from a travel distance of 60 km to the nearest radiation-treatment facility, the willingness of patients to travel for radiation therapy on a daily basis for many weeks significantly decreases. Also, the duration of APBI using brachytherapy lasting only 4.5 day as compared to 6-7 weeks of WBI is seen by most patients as extraordinarily attractive.

Conclusions: Summarizing the facts available to date it is obvious: firstly that APBI using brachytherapy techniques – offering low recurrence rates at least comparable to WBI – works excellently, and secondly that brachytherapy is today (one of) the best techniques for Accelerated Partial Breast Irradiation (APBI).

Key words: APBI, breast cancer, breast conserving surgery.

Balloon and hybrid applicators in Polish reality

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Abstract

Accelerated Partial Breast Irradiation (APBI) represents an alternative to traditional whole breast irradiation (WBI) in breast cancer patients who underwent breast conserving therapy (BCT). There are many techniques for APBI delivery, including external beam radiotherapy (EBRT), interstitial or intracavitary brachytherapy (BRT) as well as intraoperative RT. Indications and contraindications for APBI treatment are elaborated by international scientific committees, European GEC-ESTRO, American Brachytherapy Society (ABS), and American Society of Breast Surgeons (ASBS). High dose rate (HDR) BRT techniques of APBI have long been used in major polish brachytherapy departments. The balloon applicators (Mammosite, Contura) have been available in Poland for a few years. The Strut-Adjusted Volume Implant (SAVI) has been implemented in Poland in 2012. It is regarded to be a simple brachytherapy technique. The catheter is placed under USG control in the breast cav-

ity either during the lumpectomy procedure or 2-6 weeks after BCT. CT imaging is used to assess the adequate placement of the device. Patients are usually treated twice a day for 10 fractions over 5 to 7 days. This catheter provides an easily reproducible technique for breast brachytherapy. The main limiting factors of this method are poor cavity conformance, and inadequate skin distance. Of great importance in the selection of this APBI technique is a good team cooperation (radiation oncologist-surgeon-pathologist), and economic considerations. At present, WBI remains the standard of care after lumpectomy. However, preliminary results show that APBI may be an appropriate and more user-friendly mode for delivering radiotherapy than is WBI. Patients with early breast cancer, favorable histology, and interested in APBI should be enrolled onto a number of ongoing trials or be a part of an institutional review board – approved clinical registry. The panel recommends that the application of APBI should still be approached carefully on a case-by-case basis. Extended follow-up will be required to determine the long-term efficacy of this treatment modality.

Key words: balloon, brachytherapy, breast cancer, Contura, Savi.

Brachytherapy as a boost – an effective alternative

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Abstract

Purpose: BCT (breast-conserving therapy) is considered as a standard care for patients with early stages of breast cancer. Tomography-based computed planning of treatment is recommended as optimal radiotherapy after excision of the tumor. Ten-year period results of clinical trials, eg. EORTC 22881-10882 trial, have demonstrated that a boost to the original tumor bed significantly reduced rate of local recurrence after BCT, and whole-breast irradiation. The boost dose commonly used is between 10 and 16 Gy. The most commonly used, and compared with each other boost techniques include: EBRT with use of electrons or 3D photon beams, and HDR interstitial brachytherapy. Comparison of different boost techniques can be performed by assessing such parameters as: rate of local recurrence, size of a reference volume for GTV, PTV, dose homogeneity, and cosmetic results. An important factor taken into account in treatment evaluation is cost of treatment. Economic analysis has shown in most of cases higher costs for dosimetry, and verification of fractionated irradiation techniques 3D EBRT. With introduction of new techniques such as IMRT with multileaf collimators or dynamic wedges that make it possible to achieve optimum isodose distributions, the question arises about the role of interstitial brachytherapy. Clinical studies have shown that interstitial brachytherapy allows for a reduction in volume of irradiated tissue, and particularly in cases of large breasts and tumor bed makes possible to achieve better local control, and cosmetics results. The interstitial brachytherapy group presented lower percentage of tissue fibrosis, and the mean volume of tissue irradiated was between 2 and 4 times lower (eg. Van Limbergen, Vicini, Perez).

Conclusions: HDR interstitial brachytherapy boost technique is a method of radiation resulting in better clinical, and cosmetic results in selected groups of patients. It is characterized by a lower cost incurred compared to 3D EBRT techniques.

Key words: breast cancer, boost, HDR brachytherapy.

Local anaesthesia in Accelerated Partial Breast Irradiation

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Abstract

Purpose: Accelerated Partial Breast Implantation (APBI) becomes important adjuvant modality for early breast cancer patients. Due to age, many women have increased risk of complications during general anaesthesia. This study aimed on quality of local anaesthesia during multicatheter implantation procedure.

Material and methods: 85 consecutive APBI patients filled anonymously the anaesthesia quality questionnaire (AQQ). Pain Intensity was evaluated in 10 points scale.

Results: Every AQQ was valid, however, there were information lacking in several questionnaires. Median score on pain scale after the catheter implantation was 2 points (range 0-8). 45 women suggested that the most painful procedure was breast skin anesthetization. 70 women gave maximum of 10 points, when asked to evaluate APBI on last day. Median score was 10 points (range 7-10). All of the patients did not regret they chose APBI BT. Moreover, they would recommend it to their friends. In univariate analysis fear of pain strongly correlated with pain during implantation (HR: 7.5; $p = 0.000$). Also APBI anxiety was linked to pain during procedure (HR: 2.96; $p = 0.007$).

Conclusions: Local anaesthesia for multicatheter implantation in APBI patients is a good alternative to general anaesthesia. Breast cancer patients were content of choosing this option of adjuvant treatment.

Key words: APBI, breast cancer, local anaesthesia.

Session V

Treatment planning in brachytherapy – on the way to perfection

Modern dose optimization algorithms and routine using of the advanced three dimensional methods of imaging in brachytherapy treatment planning

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Abstract

Nowadays, the modern methods of brachytherapy treatment planning are mostly based on advanced methods of imaging. The use of registered images from different sources , the use of deformation during this processes allows better precision in terms of physical, and clinical applications based on geometry reconstruction of the structures and applicators.

Precise data of the applicator geometry , target volume, the position of healthy tissue and critical organs can help to achieve more conformal dose distributions as result of brachytherapy treatment planning. However, this implies the necessity of introducing algorithms for computing dose distributions, adequate to the clinical situation previously reconstructed on the basis of image data used. Widespread use of the stepping sources in brachytherapy enabled modulation of the dose distribution by appropriate choice of the position of the catheters itself, and the duration of steep time in the individual active position. The collection of information about position, and time in the final set of treatment as well as data generated by the treatment planning system, are closely correlated with the desired clinical dose distribution. Availability of a variety of commercial, and experimental optimization algorithms allows the proper selection to use algorithm depending on the complexity, and number of degrees of freedom in a clinical situation. The choice of method used is also dependent on the whole process regime - it is clear that time-consuming calculations are inadequate for real time procedures. The process of the treatment planning is a complex and multistep process that often requires the cooperation of radiologists, radiation oncologists, and medical physicists. The widespread use of advanced imaging techniques leads to more conformal treatment plans. It allows to precisely deposit the dose in treatment volume, and simultaneous protection of critical organs and healthy tissues. Parameters used for assessment of dose distributions, and support from decision-making mechanisms built in optimization algorithms, allows to prepare clinically beneficial treatment plans, but only when used properly by well trained, experienced multidisciplinary team.

Key words: brachytherapy, optimization, 3D imaging, treatment planning.

Dose calculation for photon-emitting brachytherapy sources with average energy higher than 50 keV: Report of the AAPM and ESTRO – summary of recommendations

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Abstract

Short-cut of recommendations of the American Association of Physicists in Medicine (AAPM), and the European Society for Radiotherapy and Oncology (ESTRO) on dose calculations for high energy (average energy higher than 50 keV) photon-emitting brachytherapy sources is presented. This report reviews the dosimetry data for high-energy Ir192, Cs137, and Co60 sources in current clinical use in North America and Europe, which satisfy the AAPM's dosimetric requirements. This report considers the application of the TG-43U1 formalism to high-energy photon-emitting sources. This report analyzes the following TG-43U1 formalism issues: phantom size effects, interpolation accuracy dependence on dose calculation grid size and dosimetry parameter dependence on source active length. The methodology necessary to derive the source consensus dataset is described. Methodological recommendations for experimental source dosimetry, and for Monte Carlo based dosimetry are supplied. Choice of detector and phantom material is discussed. Good practice for Monte Carlo calculations is analyzed. All basic TG-43U1 parameters are considered: air-kerma strength, dose rate constant, radial dose function, and 2D anisotropy function. The role of non-Monte Carlo computational tools in reference dosimetry is discussed. Recommended dosimetry datasets for high energy photon brachytherapy sources is supplied. There is an

overview of brachytherapy HDR, PDR, and LDR sources for which consensus datasets have been obtained.

Key words: AAPM Report, brachytherapy sources, ESTRO, TG-43U1.

Radiobiology of prostate cancer

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Abstract

The α/β value of prostatic adenocarcinoma is a topic of contention in the literature since almost 15 years with value estimated from 1.2 Gy to 8.8 Gy. The radiobiological models LQ or TCP suggest a rational basis for choosing among several radiotherapeutic modalities based on biologic risk factors. The biologic parameters α/β and Tp (long potential doubling times) are measures of intrinsic radiosensitivity and biologic aggressiveness, and are used to define tumor risk groups.

Many parameters, such as tumor repopulation, hypoxia and heterogeneity, as well as dose distribution, different treatment duration, relative biological effectiveness, half-time for sublethal damage repair, could impact the α/β value. Most of the clinical studies available now seem to support idea of low α/β value for prostate cancer that may favour hypofractionated regimes, which could be benefit for both the patient and the radiotherapy department. However, there are many other radiobiological factors that have to be taken carefully into consideration, so that they would not lead to a failure of the hypofractionated treatments to produce the expected results.

Key words: α/β value, prostate cancer, radiobiology.

Comparison of the physical properties of Co-60 and Ir-192 sources – return of cobalt?

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Abstract

Purpose: Comparison of radioactive sources of Co-60, and Ir-192 using in HDR brachytherapy produced by the most popular companies in European market. Assessment of costs of exploitation equipment for brachytherapy, and the cost of implementation the procedures.

Material and methods: Comparison included: construction, distribution of radiation (radial function, anisotropy), step, method of source movement, and active length radiation sources of the isotope Ir-192 produced by Nucletron, Varian and BEBIG, and for radioactive isotope Co-60 produced by BEBIG.

Results: Afterloaders equipped with source Ir-192 produced by Nucletron and BEBIG have similar physical structure of capsule with radioactive isotope, which has comparable effect on distribution of radiation. Varian afterloader is equipped with two Ir-192 radiation sources, active length used during radiation is longer what influences on treatment planning. Isotopes of Ir-192, and Co-60 has different average photon energy produced during radioactive decay (EIr-192 = 380 keV, ECo-60 = 1.25 MeV), and different half-life (T1/2 Ir-192 = 72.8 day, T1/2 Co-60 = 5.26 year), which brings differences in radial distribution of the radiation, its range, and distribution of radiation around capsule containing the isotope. BEBIG's afterloader with isotope Co-60 has different times of irradiation of the patient (the difference between 10% and 20%), frequency of replacement source (every 5 years vs. every three months), which affects on globally much lower operating costs.

Conclusions: Equipping new brachytherapy department should take into account the number of treated patients, the most common location of tumors in which brachytherapy will be using, and costs of exploitation brachytherapy devices. Very important are presented factors.

Key words: Co-60, HDR, Ir-192, physical properties.

Dose distribution in brachytherapy – what awaits us after the TG-43?

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Abstract

Treatment planning using the data published by Task Group 43 of American Association of Physics in Medicine is commonly used in brachytherapy for over fifteen years. Dose calculation using this formalism has been satisfactory over this time. Nowadays the computing possibilities of treatment planning systems give opportunity to calculate dose distribution in non homogenous media in reasonable time, which was impossible earlier.

AAPM TG-186 worked on recommendations for clinical implementation of model – based dose calculation algorithms (MBDCA) for brachytherapy. As for lower energies, the medium impact on scatter conditions is higher, so the more important is to determine the real radiation absorption. Furthermore, the voxel-by-voxel interactions have a big influence on dose distribution, so the ICRU/ICRP composition of tissue is not solving this problem. Beside of that, the applicator range used in brachytherapy such as metal needles, shielding or source construction itself increases the uncertainty of dose calculation. There is a need to remove all the artifacts, and replace them with proper

material equivalent before dose calculation, using model – based algorithms. For safely clinical use, AAPM TG-186 suggest two levels of commissioning. First level is to test agreement of obtained dose distribution with TG-43 based algorithm in homogenous conditions. Each significant disagreement should be carefully examined as the TG-43 is still respected standard. Level 2 commissioning compares MBDCA dose calculation for specific virtual phantoms mimicking clinical cases, and benchmarked dose distribution for reference phantom geometries.

Key words: dose calculations, treatment planning, TG-43.

Sesion VI

Radical or palliative treatment – difficult choices

Lung cancer brachytherapy – 3D treatment planning and its benefits in palliative care

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Abstract

Endobronchial brachytherapy, as a method of palliative treatment of lung cancer, is undergoing a renaissance for few years. It was somewhat forgotten, and not developed. In the era of the use of 3D and even 4D treatment planning techniques, endobronchial brachytherapy was still used in 2D. The wide availability of CT scanners and advanced 3D planning systems in cancer centers, gives us possibility to plan endobronchial brachytherapy with 3D technique. Contrary to common opinion, the assertion that such treatment is very time-consuming, in a well-organized facilities it runs even faster than 2D planning. The benefits of 3D planning include: better coverage of PTV by treating isodose, more conformal distribution of the isodoses, better OARs, and implanted pacemakers sparing. The analysis of 50 treatment plans was performed. In all cases 2D and 3D planning has been done. The detailed results will be presented during the lecture.

Key words: 3D treatment planning, brachytherapy, lung cancer, palliative care.

Palliative brachytherapy of lung and esophageal cancer

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Abstract

HDR brachytherapy has been widely used for the treatment of esophageal cancer, alone or in combination with EBRT. Advanced stage of the disease, reduced performance status, and weight loss are associated with poor prognosis and palliative treatment intent. The HDR technique involves insertion of the intraluminal applicator, often with surgical dilatation, determination of the active length, which includes the length of tumor, and a margin of 2-5 cm, by fluoroscopy or endoscopy. The dose is prescribed at 1 cm from the source axis or 0.5 cm from applicator surface. Different doses of brachytherapy alone have been reported in literature: 12-20 Gy in two session, 18 Gy in three sessions or 10-18 Gy in one session. Higher dose significantly improved dysphagia-free survival, and persistent tumor growing comparison with 12 Gy in two sessions. Expected level of dysphagia decrease is 50-75%, severe complications (fistulas) 4-10%, recurrent dysphagia 7-40%. Despite slow improvement, single-dose brachytherapy gives better long-term relief of dysphagia, and is associated with fewer complications in comparison with metal stent placement. Doses of 10-12 Gy in two fractions have been used to boost 50-60 Gy EBRT with significant improvement in 2-year local control when compared with 50 Gy or more EBRT alone. Contraindications for brachytherapy include esophageal fistula, and cervical location of the tumor. Palliative brachytherapy for lung cancer plays a similar role to the esophageal cancer, but spectrum of symptoms of endobronchial propagation is wider: haemoptysis, obstructive pneumonia or atelectasis, cough and dyspnoea. Dose and fractionation schedules vary widely, ranging from 15 Gy in one fraction to 20 Gy in five fractions. The ABS suggests using three weekly fractions of 7.5 Gy each or two fractions of 10 Gy each or four fractions of 6 Gy each prescribed at 1.0 cm from the source axis, when HDR is used as the sole modality. Two fractions of 7.5 Gy each or three fractions of 5 Gy each or four fractions of 4 Gy each are used as a planned boost to supplement palliative EBRT of 30 Gy in patients with no previous history of thoracic irradiation. Successful palliation rate is greater than 2/3.

Key words: esophageal cancer, HDR, lung cancer, palliative brachytherapy.

Care for patients after prostate brachytherapy

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Abstract

Prostate brachytherapy is a radiotherapy method which offers a precise way to administer an appropriate dose of ionizing radiation to the prostatic capsule, while minimizing the risk of irradiation of critical structures, i.e. the uretha and the rectum. High dose-rate (HDR) brachytherapy involves the temporary implantation of metal needles directly into the treatment area, followed by their connection to the HDR delivery system for the purpose of prostate irradia-

tion. Low dose-rate (LDR) brachytherapy consists of permanent implantation of radioactive seeds directly into the prostate. The basic aspects of nursing care in brachytherapy include: monitoring of patients after the procedure to detect complications in the urinary, circulatory and respiratory systems, introduction of measures to prevent infections and lower extremity thrombosis, patient education with regard to proper care, radiation protection and maintenance of optimal quality of life.

Key words: cancer care, nurse care, prostate cancer.

POSTER PRESENTATIONS

Analysis of PSA kinetics in prostate cancer patients treated with HDR monotherapy

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Abstract

Background: Serum PSA level is the most commonly used method of monitoring response to prostate cancer therapy. Following HDR brachytherapy, PSA levels gradually decline, however usually remain detectable.

Material and methods: Between July 2008 and December 2009, the initial 26 patients with histopathologically diagnosed prostate adenocarcinoma were treated with HDR-BT at the Greater Poland Cancer Centre. The baseline median PSA level was 6.4 ng/ml (range: 4.1-10.2), whereas the median Gleason score was 6 (range: 3-7). The patients were treated with HDR brachytherapy at a dose regimen of 3 x 15 Gy (45 Gy in total). A significant increase in PSA level ("PSA bounce") was defined as a PSA rise by at least 0.2 ng/ml followed by a spontaneous decrease to the prior baseline level or lower. Biochemical recurrence was defined as "nadir PSA + 2 ng/ml".

Results: The median follow-up period was 3 years and 8 months. Two patients were lost to follow-up. In five cases (19%), a PSA bounce was observed after an average follow-up period of 10 months post-treatment. Biochemical recurrence was confirmed in three cases (11%) after an average follow-up period of 36 months post-treatment. A constant decline of the PSA level was observed in the remaining cases. One case of bone metastases was identified six months after treatment.

Conclusions: HDR brachytherapy ensures a high level of biochemical and clinical control in low- and intermediate-risk prostate cancer patients. PSA bounce in patients after HDR brachytherapy has been reported in literature to occur during the first two years after treatment, which is consistent with our findings. The case of bone metastases, considering its rapid onset after treatment, may have been caused by failure to diagnose metastatic disease prior to the initiation of therapy.

Key words: HDR brachytherapy, monotherapy, PSA bounce.

HDR interstitial brachytherapy as salvage therapy in selected patients with adenocarcinoma of the rectum

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Abstract

Background: Assessment of efficacy and toxicity profile in patients treated with HDR interstitial brachytherapy due to adenocarcinoma of the rectum who have refused radical treatment.

Material and methods: Between April 2009 and May 2013, a total of eight patients with rectal adenocarcinoma received conformal HDR brachytherapy with temporary interstitial implants. The average age of the patients was 71 years. The total doses used were: 30 Gy/5 days; 24 Gy/4 days and 10 Gy/1 day. 3D treatment planning was based on CT, Oncentra Master Plan and PLATO. Dosimetry parameters for the target site: V_{100}, V_{150}, V_{200}, D_{90}. The patients had follow-up visits once a week during brachytherapy; at 1, 3, 6, 9 and 15 months after the completion of brachytherapy; and then on a three-monthly basis. Each follow-up visit comprised a clinical examination and imaging tests including ultrasound and X-ray studies, and CEA. Acute radiation reactions were assessed in the EORTC/RTOG scale.

Results: The mean follow-up period was 12 months (3-48). The most common adverse reactions were related to the rectum and included pain, haemorrhaging, pencil-thin stools, faecal incontinence and faecal urgency. Radiation reactions (EORTC/RTOG grade 4) were noted in 25% of the patients. The assessment of long-term survival requires a longer follow-up period.

Discussion: HDR-BTR proved to be a valuable treatment modality for a selected group of patients with adenocarcinoma of the rectum. The therapy was well tolerated by the majority of patients, with an acceptable increase in toxicity, however the assessment of long-term survival requires a longer follow-up period.

Key words: HDR brachytherapy, rectal cancer, recurrence.

Tolerance of HDR brachytherapy in the treatment of locally advanced anal cancer

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Abstract

Aim: Retrospective assessment of tolerance of HDR brachytherapy in patients with locally advanced anal cancer.

Material and methods: Between January 1998 and June 2013, a total of 105 patients treated in our Centre received combined radiochemotherapy following diagnosis of locally advanced anal cancer. In 11 patients (7 women, 4 men) aged between 35 and 65 years (mean age: 53 years) the dose administered to the site of persistent infiltration of the anus was increased using Ir-192 HDR brachytherapy. The total radiation dose administered to the treatment area by brachytherapy was 7.5-20 Gy.

Results: Early tolerance of brachytherapy was good. No signs of haemorrhage or infection were noted, while pain was adequately controlled with NSAIDs. Four patients (36%) reported complaints at least one year after treatment. Abdominoperineal resection of the rectum was performed in three patients – including one with sphincter deformation and insufficiency accompanied by pain. Three patients (of which two required interruption of radiochemotherapy) were diagnosed with distant metastases to the liver or pelvic bones.

Conclusions: Because of the possibility of increasing the dose administered to the tumour site, HDR brachytherapy may be considered a therapeutic option in patients with persistent infiltration of the anus after radiochemotherapy. The tolerance and efficacy of the treatment modality, however, requires further assessment in a larger group of patients.

Key words: anal cancer, HDR brachytherapy, radiochemotherapy.

HDR brachytherapy as curative treatment of advanced lung cancer – a report of three cases

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Abstract

Introduction: The treatment of locally advanced lung cancer usually involves surgery. In some cases, however, surgery is not a treatment option due to the presence of comorbidities or severe dysfunction of the respiratory system. Such patients have been treated with HDR brachytherapy as a radical treatment modality. This radiotherapy technique is also used in patients with Tis-stage cancer and tumour recurrence at the bronchial stump. Between 2010 and 2012, three patients suffering from lung cancer were treated with HDR brachytherapy at the Radiotherapy Department in Katowice. Descriptions of three cases of brachytherapy administered to patients with locally advanced lung cancer: 1. Patient AW, aged 84 years, with a history of upper left lung lobectomy due to squamous cell carcinoma (2007). Current diagnosis: cancer of the right lung (stage T2N20). The patient was ineligible for surgery because of respiratory system dysfunction (status post-lobectomy). Monobrachytherapy at a dose of 36 Gy in six weekly fractions was prescribed. Afterwards, because of tumour size progression, the therapy was supplemented with teletherapy (total dose: 20 Gy, administered in five fractions). No further progression of the disease was observed after 18 months. 2. Patient AB, aged 62 years, with cancer located within the left bronchus (Tis-stage). Imaging tests (CT, EBUS) found no evidence of lymph node metastases. The patient was considered ineligible for surgery due to advanced stage of the disease and tumour location. Monobrachytherapy was prescribed instead. A total dose of 36 Gy was administered in six weekly fractions. The treatment was well tolerated. 3. Patient EW, aged 66 years, with squamous cell carcinoma of the left lung (diagnosed in Nov 2012). Status post right lung resection (2003) and CRT. Cancer stage: T1N0. Imaging tests revealed no signs of tumour or lymph node metastases. Bronchoscopy found a tumour in the 3rd bronchopulmonary segment of the left lung. The patient was ineligible for surgery and CRT. Brachytherapy (36 Gy in six weekly fractions) was introduced.

Results: The observed reduction of symptoms including dyspnoea, coughing, haemoptysis and impairment of physical exercise capacity is an argument in favour of HDR brachytherapy in the radical treatment of lung cancer. The tolerance of treatment was good. None of the patients suffered any complications or deterioration of their general condition. A certain limitation associated with brachytherapy is tumour size: a progression in tumour volume was noted in the patient diagnosed with a large tumour.

Conclusions: Brachytherapy used in lung cancer patients who are ineligible for surgery is a therapeutic alternative

especially in the treatment of small tumours located in the major bronchi. In addition, brachytherapy allows effective control of pulmonary neoplastic disease in patients suffering from early-stage lung cancer.

Key words: curative treatment, HDR brachytherapy, lung cancer.

Benefits of HDR brachytherapy in combination treatment of patients with oesophageal cancer

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Abstract

Introduction: In spite of steady development of surgical and radiotherapeutic techniques, and the progress of chemotherapy, oesophageal cancer treatment outcomes are still poor. Brachytherapy (BT) is a method which has not, as yet, been recognized as EBM in radical treatment. The technique, however, allows escalation of the radiation dose to the tumour site, which is an argument supporting its use in radical treatment. The suggestions arise from experience in palliative treatment of patients suffering from oesophageal cancer – especially in long-term follow-up.

Material and methods: Between 2006 and 2012, a total of 28 oesophageal cancer patients received treatment at the Radiotherapy Department in Katowice. All the patients were ineligible for surgery because of advanced stage of cancer. All the patients were histopathologically diagnosed with squamous cell carcinoma. HDR brachytherapy was given to all the patients to achieve escalation of the radiation dose to the tumour site. The total dose was 12 Gy, administered in two weekly fractions. A total of 11 patients received concomitant chemotherapy (ChRT). Seventeen patients were ineligible for chemotherapy due to comorbidities, and received BT combined with teletherapy (TRT). On completion of treatment, the patients were followed up to assess eating disorders and pain. Periodic endoscopic examinations were also performed. Patients with oesophageal stricture causing difficulties with swallowing had a stent placed. Where the oesophagus was narrowed down to ca. 1 mm, jejunostomy was performed. Patients with dysphagia and esophageal stricture to 5-6 mm underwent endoscopic dilatation. One patient had radical surgery with reconstruction and restoration of continuity of the digestive tract using a section of the small intestine.

Results: Evaluation of treatment efficacy was based on the duration of survival and the number of deaths. During a 6-year follow-up period, 13 patients experienced no dysphagia and had no endoscopic signs of tumour presence. After the 6-year follow-up period, nine patients out of the study group were alive. Six of them were treated with concomitant ChRT and three – with teletherapy.

Conclusions: The 6-year follow-up period demonstrated higher efficacy of combination treatment with chemotherapy compared to radiation therapy alone. HDR brachytherapy of the oesophagus may be applicable to the majority of patients with inoperative esophageal cancer and should be recommended for radical treatment. Its effect on long-term survival is uncertain, however during short-term follow up the technique has been shown to reduce symptoms, improving patient comfort and nutrition.

Key words: HDR brachytherapy, oesophageal cancer, palliative treatment.

In vivo dosimetry in prostate brachytherapy using MOSFET detectors

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Abstract

The study compares dose measurement values determined by *in vivo* dosimetry with dose values established during treatment planning. Treatment planning was performed with the Oncentra Prostate treatment planning system. *In vivo* dosimetry was performed using MOSFET TN-502RDM-type detectors. *In vivo* dosimetry was carried out in 45 patients by introducing the detector into an empty needle inserted into the prostate gland. An analysis was performed for potential causes of errors in the measurement of absorbed doses, related to detector calibration and source-detector geometry. The mean difference between measured and planned doses for a total of 45 measurements was –2.1% ± 6.6% (SD).

Key words: dosimetry, *in vivo*, MOSFET, prostate cancer.

Recurrent lip cancer treated with HDR brachytherapy – case report

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Abstract

A 71-year-old patient diagnosed with squamous cell carcinoma of the lower lip (T1N0M0). Surgery performed on 19 March 2012: resection of the tumour with healthy tissue margins accompanied by sliding of a mucocutaneous flap. Tumour recurrence in the scar after three months. Surgical resection of the lip scar with a margin of normal tissue on 26 June 2012. Another local recurrence (a 2 cm ulcer) developed after three months. Regional lymph nodes were assessed. The patient was qualified for brachytherapy. Four plastic guides were inserted into the lower lip tissue. A CT-based treatment plan was prepared. The dose of 51 Gy CTV was administered in 17 fractions of 3 Gy twice a day. Acute radiation reaction was observed (RTOG/EORTC 3). At 10 months post-treatment, there are no signs of cancer recurrence.

Key words: HDR brachytherapy, lip cancer, recurrence.

High-dose-rate brachytherapy as a salvage treatment for local recurrences of prostate cancer after previous radiotherapy – review

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Abstract

Purpose: To show that this particular variation of salvage treatment has a great promise with better or equal biochemical control and lower toxicity, when compared to other modalities. Radiation therapy (both EBRT and BT) as a radical treatment of organ-confined PCa, is well established and equal to radical prostatectomy, and it became a standard treatment option for patients. But it is also known that biochemical failure may come out in 10% of low risk up to 60% in high risk prostate cancer patients previously irradiated which depends on initial stage, Gleason score and PSA level. Moreover, it has been estimated that even 70% of PSA failures after radiation may be caused by local failure. Nevertheless, there is still no standard treatment for locally relapsed prostate cancer after primary radiotherapy. Radical prostatectomy, brachytherapy, cryotherapy, and high-intensity focused ultrasound are presently used as salvage options.

Material and methods: Data on the effectiveness, and complications of high dose rate (HDR) brachytherapy in this scenario are in great amount restricted to case reports and studies of very small patients groups. We have chosen reports made on groups of at least fifteen men, and those which had similar endpoints.

Results: Most common data and toxicity rates from chosen studies are summarized in Table 1 and 2.

Conclusions: With great precision of delivering high doses of radiation into the target volume, HDR brachytherapy is exceptionally fit for salvage treatment where the potential danger of complications in re-irradiated structures is extremely high. This option appears to be safe and ef-

Table 1.

Study	No. of patients	Follow-up	Dose administration	PSA value (ng/ml)	Results		
Łyczek *et al.*	115	Not specified	30 Gy (3 fr.)	Median 13.0 (initial)	6 y. GS ≤ 6 GS > 6	BC 46% 18%	OS 86% 48%
Lee *et al.*	21	Median 18.7 m. (6-84 m.)	36 Gy (6 fr.)	Median 5.9 (at failure)	2 y.	BC	89%
Pellizon *et al.*	17	Median 47 m. (15-65 m.)	34-36 Gy (4 fr.)	≤ 10 (at failure)	 5 y. 10 y. Crude	OS 73.3% 65.5% BC	DSS 87.1% 77.4% 70.5%
Wojcieszek *et al.*	68	Median 21 m. (1-53 m.)	30 Gy (3 fr.)	Median 13.619 (initial) Median 3.126 (at failure)	3 y. Diss.	BC FS	65.7% 85.4%

Table 2.

Study	Early urinary toxicity	Late urinary toxicity	Early rectal toxicity	Late rectal toxicity
Łyczek *et al.*	G1– 11.3% G2 – 18.3% G3 – 5.2%	G2 – 7.0% G3 – 6.1% G4 – 6.1%	G1 – 7.0% G2 – 0.9%	G2 – 1.7% G3 – 0.9%
Lee *et al.*	G1-2 – 85.7% G3 – 14.3%	G3 – 4.8%	G1-2 – 14.3%	Wasn't observed
Pellizon *et al.*	–	G3 – 17.6 G4 – 5.9	–	G2 – 47.1 G3 – 5.9
Wojcieszek *et al.*	G1-2 – 95.6%	G3 – 2.9% G4 – 7.3%	G1 – 7.3%	G1 – 7.3%

fective, but there is a need of randomized studies on bigger groups of patients.

Key words: HDR brachytherapy, prostate cancer, recurrence, salvage therapy.

Bialystok Comprehensive Cancer Center clinical experience using the Contura multi-lumen balloon breast brachytherapy catheter to deliver Accelerated Partial Breast Irradiation (APBI)

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Abstract

Purpose: We review our institution's clinical experience in treating patients with the Contura Multi-Lumen Balloon (SenoRx) breast brachytherapy catheter to deliver accelerated partial breast irradiation (APBI).

Material and methods: Seventeen patients treated with breast-conserving therapy received adjuvant radiation using the Contura catheter (34 Gy in 3.4 Gy fractions), Oncentra Master Plan Brachy treatment planning system. Dose volume constraints for this planning system included: ≥ 95% of the prescribed dose (PD) covering ≥ 95% of the target volume (TV); maximum skin dose ≤ 125% of the PD; maximum rib dose ≤ 145% of the PD; and V150 ≤ 50 cc and V200 ≤ 10 cc.

Results: The most common side effects were: redness, bruising and breast soreness (50% – stage I and 50% – stage 0). Some patients (1%) reported persistent seroma from the catheter site. No clinically detectable telangiectasias were developed. No major toxicities (Grade III and IV) were observed. The median dose to 95% of the planning target volume for evaluation was 97%.

Conclusions: Adjuvant APBI using the Contura multilumen balloon catheter exhibited good loco regional control, satisfying cosmetic effect, and acceptable toxicities. APBI improves radiation standards for the delivery of APBI and significantly decreases treatment time course. Overall survival data need longer follow up.

Key words: APBI, balloon, breast cancer, Contura.

HDR intracavitary brachytherapy as a treatment of choice in urethral carcinoma of elderly female patient – case report

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Abstract

Purpose/Objective: To present results and toxicity profile of salvage intracavitary brachytherapy HDR in urethral carcinoma of female elderly patient.

Material and methods: 82-years old woman with T4NxMo squamos cell carcinoma G2, suffering from urination pain and urinary retention underwent intracavitary (intravaginal and intraurethral) HDR brachytherapy. The patient received 35 Gy in 5 fractions (7 Gy per fraction once a week). HDR brachytherapy was delivered using Iridum-192 source (MicroSelectron, Nucletron). The plan was prepared in 3D based on CT and Oncentra Master plan planning software. Dose volume constraints for this planning system included for target: V100, V150, V200, and D90. Patient was monitored weekly during brachytherapy. Acute toxicities were graded according to the EORTC/RTOG scales.

Results: 2 weeks after treatment, 90% of macroscopic remission was observed. Treatment was well tolerated, the most common symptoms were: slight pain and swelling.

Conclusions: HDR brachytherapy seems to be effective, and well tolerated treatment modality in locally advanced female urethral cancer patients. The presented case indicates that this procedure may be a good option especially for elderly patients. However, overall data need longer follow-up.

Key words: HDR brachytherapy, intracavitary, urethral carcinoma

Salvage Image-Guided HDR-IBT in vulvar cancer recurrence

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Abstract

Purpose: Vulvar cancer recurrences occur in 24% of cases (on average) after primary treatment. They occur locally near the original resection margins. Interstitial HDR brachytherapy (HDR-IBT) delivers high radiation doses directly to the tumor volume, and rapid dose fall-off beyond the implant volume. The introduction of CT image guided HDR-BT has allowed for 3D treatment planning, and gave the ability to better delineate the target volumes. The aim of our study was to report our experience with CT-based salvage HDR-IBT for locally recurrent vulvar cancer.

Material and methods: From 2011 to 2013, seven women with locally recurrent vulvar cancer were treated with curative intent using HDR-IBT. All patients underwent previous vulvectomy and EBRT. Mean time to recurrence was 14 months. Flexible catheters were inserted under local anaesthesia, free-hand technique. Target volumes were determined by clinical examination, and CT imaging. Treatment plans were calculated with Oncentra MasterPlan v 4.1 (Nucletron™) based on a cone beam CT imaging (Simulix Evolution Nucletron™). The prescribed dose was 24.5-42 Gy (median 33 Gy), fractionation dose was 3-3.7 Gy twice a day.

Results: Median follow up was 26 months. In 4 cases, local control was achieved, and in 3 cases a progression was noticed. There was no complications during implantation. Treatment was well tolerated by all patients. Acute toxicity consisted predominantly of vulvar oedema, and radiation mucositis that dissolved during 6-8 weeks after the treatment.

Conclusions: In selected patients with recurrent vulvar cancer image-guided HDR-IBT is well tolerated salvage treatment option. Image-guided HDR-IBT allows to minimize the risk of dose escalation, and is especially a valuable option for patients after previous EBRT. This hypothesis should be tested with a larger group of patients.

Key words: image-guided, HDR brachytherapy, recurrence, salvage, vulvar cancer.

HDR intenstinal brachyterapy as a salvage treatment in rectal adenocarcinoma patients

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Abstract

Purpose/Objective: To analyze efficacy and toxicity profile of salvage intenstinal brachytherapy HDR in rectal adenocarcinoma patients after tumorectomy, who refused or was not classified for radical resection.

Material and methods: Between April 2009 and July 2012, 9 patients with rectal adenocarcinoma underwent conformal HDR brachytherapy (HDR-BRT) with a temporary interstitial implant (3-5 catheters). The mean age of patients was 71 years. 6 of them received 30 Gy in 5 days 3 Gy per fraction twice daily, one received 24 Gy in 4 days, 4 Gy per fraction, and one patient received 10 Gy single fraction. Treatment plan was prepared in 3D based on CT, Oncentra Master plan and PLATO planning software. Dose volume constraints for this planning system included target: V_{100}, V_{150},V_{200}, D_{90}. Patients were monitored weekly during radiotherapy, and 1, 3, 6, 9 and 15 months after the end of treatment, followed by three months interval. Follow-up visit included clinical, and surgical examination, radiology exam (ultrasound of abdomen and liver; chest Xray), and CEA value assessment. The acute toxicities were graded according to the EORTC/RTOG scales.

Results: Median follow up was 29 months (15-48). One local recurrent was observed. The most common symptoms were: pain, swelling, bleeding, thin stool, rectal urgency, frequency, tenesmus and acute proctitis. 20% grade 4 acute toxicities were recorded. However, overall survival data need longer follow-up.

Conclusions: HDR-BRT is a valid anal sphincter sparing treatment modality for selected patients. HDR-BRT has an important role in achieving dose escalation for some patients. The treatment was well tolerated by majority of patients with acceptable degree of acute toxicities. Overall survival data need longer follow-up.

Key words: HDR brachytherapy, intenstinal, recital cancer, salvage treatment.