Elaborare documentație pentru fizicieni medicali

Brahiterapia

Brahiterapia continuă să fie foarte importantă în radioterapie, fiind esențială în tratamentul curativ al cancerului de col uterin (o patologie foarte frecventă în anumite regiuni) dar și în alte tumori din sfera ginecologică. O altă boală în care brahiterapia a devenit foarte importantă este cancerul de prostată (formele localizate). Raportul cost-eficiență al brahiterapiei poate fi crescut folosind sisteme HDR (high dose rate). Cu ajutorul acestora tratamentul poate fi administrat în câteva minute, în regim ambulatoriu, fără internarea pacienților, așa cum era necesar în trecut. Mai mult, introducerea surselor miniaturizate ^{60}Co pentru brahiterapie au făcut aceste sisteme și mai eficiente. Având în vedere că timpul de înjumătățire a unei surse de Co^{60} este de 5,27 ani, ea poate fi înlocuită la cinci ani, comparativ cu sursa de Ir^{192} (Iridiu 192), care trebuie înlocuită la fiecare trei-patru luni. Economisirea resurselor este semnificativă. În prezent, există un interes special pentru „brahiterapia electronică", în care sursele radioactive sunt înlocuite cu surse electronice miniaturizate de fotoni.

În acest document raportăm o serie de articole științifice noi, publicate în literatura de specialitate, referitoare la folosirea brahiterapiei ca metodă nouă de tratament în terapia cancerului. Aceste articole vor fi puse la dispoziția studenților pe canalele de comunicare on-line (platform Teams, site-ul proiectului).

Documentul este organizat în felul următor:

1. datele de identificare a articolelor (autori, titlu, anul apariției, volum, pagina de început și sfârșit/numărul articolului, adresa DOI.
2. abstractul articolului
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Lista articolelor propuse

Articol 1

1. Zhong-Ke Chen, Jing Fan, Fen-Qiang Li, Shi-Yan Zhou, Yuan-Shun Xu,

I-125 seeds with chemotherapy for progressive non-small-cell lung cancer after first-line treatment: a meta-analysis, Journal of Cardiothoracic Surgery (2022) 17:75
https://doi.org/10.1186/s13019-022-01820-y

Abstract

Background: Continuing therapy for aggressive non-small-cell lung cancer (NSCLC) after first-line treatment (FLT) is challenging. The clinical efficacy of second-line chemotherapy (SLCT) for progressive NSCLC is limited. In this metaanalysis, we aim to evaluate the clinical efficacy of the combination of I-125 seeds brachytherapy (ISB) and SLCT in progressive NSCLC after FLT.

Methods: The PubMed, Embase, Cochrane Library, CNKI, Wanfang, and VIP databases were screened for relevant publications until September 2021. Meta-analyses are conducted by RevMan 5.3 and Stata 12.0.

Results: Our meta-analysis encompassed 6 studies (4 retrospective studies and 2 randomized controlled trials), which included 272 patients that underwent ISB with SLCT (combined group) and 257 patients that received SLCT alone (chemotherapy alone group). The complete response (24.7% vs. 7.0%, $P < 0.00001$), treatment response (65.7% vs. 38.1%, $P = 0.0002$), and disease control (95.2% vs. 80.4%, $P < 0.00001$) rates are markedly elevated for patients receiving combined therapy versus those receiving chemotherapy alone. Moreover, pooled progression-free survival ($P = 0.0001$) and overall survival ($P < 0.00001$) were remarkably extended for patients that received the combination therapy, while no obvious differences were detected in the pooled myelosuppression (39.0% vs. 30.6%, $P = 0.05$) and gastrointestinal response (38.5% vs. 35.9%, $P = 0.52$) rates between 2 groups. Significant heterogeneity was found in the endpoints of the treatment response and progression-free survival.

Conclusions: This meta-analysis demonstrated that ISB could enhance the clinical efficacy of SLCT in patients with progressive NSCLC after FLT without inducing major toxic side effects.
Keywords: I-125 seed, Non-small-cell lung cancer, Progressive, Meta-analysis

Concluzii

In summary, the current meta-analysis demonstrated that ISB could enhance the clinical efficacy of SCLT inpatients with progressive NSCLC following FLT without inducing toxic side effects.

Articol 2

2. Anna Wronezewska, , Renata Kabacińska, Anysja Zuchora, Roman Makarewicz, Joanna Terlikiewicz, Andrzej Lebioda, The effect of geometrical optimisation on some parameters of dose distribution as exemplified by brachytherapy applied in patients with breast cancer, Proceedings of the Gonferenca "Brachytherapy 2000", Jurata, Poland, 6 -7 October 2000. Rep. Pract. Oncol. Radiother. 6 (3) 2001.

Abstract

Purpose: The analysis *ot* the dose distribution parameters *tor* two-plane implants in the breast using geometrical optimisation.

Material and methods: The analysis was carried out on dose distribution parameters, and on the dose distribution quality index (QI) *tor* 20 two-plane applications administered in our clinical practice. The toliowing parameters were determined: the reference volume V100, the irradiated volume V50, and the high dose volume V50. These parameters were analysed both in the case *ot* geometrical optimisation *of* dose distribution, and in the case without optimisation.

Key words: breast cancer, HDR brachytherapy, dose distribution, geometrical optimisation, quality index.

Concluzii

Conclusions:

Geometrical optimisation leads to an increase in the reference volume V100.

As contrasted with the conventional non-optimised implant, in accordance with the Paris System of interstitial brachytherapy, the above system of optimisation makes it possible to limit the active length of the implant which does not extend beyond the target area, which has its advantage when, in breast implants, the target area is bordering the skin.

Articol 3

3. Paloma Albuquerque Pontes, Flávia Oliveira de Almeida Marques da Cruz, Paula Elaine Diniz dos Reis, Validation of a guidance manual for patients undergoing brachyterapy for gynecologic cancer, Cogitare enferm. 25: e67109, 2020, http://dx.doi.org/10.5380/ce.v25i0.67109

Abstract

Objective: to validate the content of a guidance manual for women undergoing brachytherapy for gynecologic cancer.

Method: methodological research conducted by 15 experts in the topic addressed in the manual, including nurses, doctors, psychologists and nutritionists. A minimum level of agreement of 80% between the experts was required for the validation of the manual.

Results: Of the 21 items assessed, three did not reach the minimum level of consensus established and were reformulated based on the suggestions of the participants and on the current literature. All other items were considered appropriate and/or totally appropriate in the three assessment domains: objectives - 81.3%, structure and presentation - 86.6%, and relevance - 94.6%.

Conclusion: the educational manual was validated for its content and can be used as a complement to the verbal guidelines provided during nursing consultations to promote self-care, and to facilitate communication between healthcare professionals and patients regarding the treatment.

DESCRIPTORS: Brachytherapy; Female Genital Cancers; Health Education; Nursing Care; Validation Studies.

Concluzii

The validation performed by experts made it possible to improve the manual and, after the suggested changes were implemented, the final version of the material is considered valid in terms of its content, which is based on the needs of patients with gynecologic cancer undergoing brachytherapy. A new study aimed to pursue the process of validation of the manual to the target population will be conducted. It is expected that after this stage is concluded the manual can be widely used during nursing consultations of the Radiation Therapy Outpatient Unit of Hospital Universitário de Brasília, and, subsequently, adapted to the specificities inherent to each healthcare unit for use in other health services that offer radiation therapy.

Articol 4

4. Vlastimil Valek, Petr Kysela, Zdenek Kala, Igor Kiss, Jiri Tomasek, Jiri Petera Brachytherapy and percutaneous stenting in the treatment of cholangiocarcinoma: A prospective randomised study, European Journal of Radiology 62 (2007) 175–179, doi: 10.1016/j.ejrad.2007.01.037

Abstract

Purpose: To evaluate the effect of radiation therapy including intraluminal brachyterapy with iridium-192 on survival of patients with malignant biliary strictures (cholangiocarcinoma, histologically improved) treated with metallic stent in a prospective randomised study.

Method and materials: In the prospective randomised study, 21 patients with cholangiocarcinoma were treated with implantation of percutaneous stents followed with intraluminal Ir-192 brachytherapy (mean dose 30 Gy) and external radiotherapy (mean dose 50 Gy) and 21 patients were treated only with stents insertion. We did not find any statistically significant differences in age and tumor localization between these two groups of patients.

Results: All the patients died. In the group of patients treated with brachytherapy and with stent implantation, the mean survival time was 387.9 days. In the group of patients treated only with stent insertion the mean survival was 298 days. In effort to eliminate possible effect

of external radiotherapy we treated the control group of eight patients with cholangiocarcinoma by stent insertion and brachyterapy only.

Conclusion: Our results show that combined radiation therapy could extend the survival in the patients with cholangiocarcinoma obstruction.

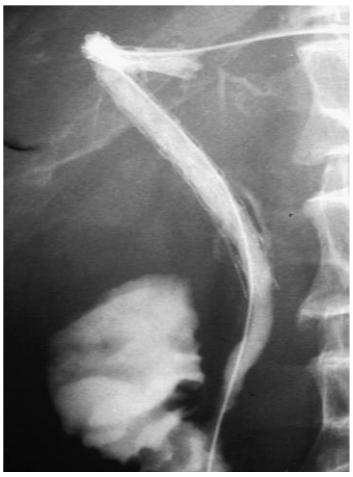

Fig. 2. Self-expandable stent inserted after PTD from the left side.

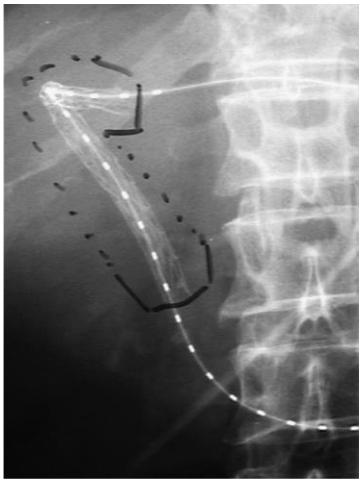

Fig. 3. Brachytherapy planning. The planning guidewire is inserted percutaneously through the stent

Concluzii

In locally advanced biliary tree cholangiocarcinoma, radiation therapy provides palliation and may prolong survival. ILBT was intensely investigated last 20 years, but it is still not commonly practiced nowadays. Newer radiation therapy techniques, including ILBT, intraoperative radiation therapy, intensitymodulated radiation therapy and three- and four-dimensional treatment planning, permit radiation dose escalation without significant increases in normal tissue toxicity, thereby increasing the effective radiation dose. Our prospective randomized study showed that ILBT after percutaneous stent insertion significantly prolong survival at the patients with cholangiocarcinoma. In addition to improvement of life expectancy, the prolonging of symptom-free period is an important target of the treatment as well. The data from our prospective randomized study support data from literature. We conclude that intraluminal brachytherapy can significantly prolong survival

time at the patients with unresectable cholangiocarcinoma treated by percutaneous stent insertion.

Articol 5

5. Hideyasu Tsumura, Nobumichi Tanaka, Tomohiko Oguchi, Takuya Owari, Yasushi Nakai, Isao Asakawa, Kazuyoshi Iijima, Haruaki Kato, Iwao Hashida, Ken-ichi Tabata, Takefumi Satoh, Hiromichi Ishiyama, Comparative effectiveness of low-dose-rate brachytherapy with or without external beam radiotherapy in favorable and unfavorable intermediate-risk prostate cancer, www.nature.com/scientificreports, 2022, 12:11023, https://doi.org/10.1038/s41598-022-15028-6

Abstract

We compared clinical outcomes associated with seed brachytherapy (SEED-BT) alone and SEED-BT plus external-beam radiotherapy (EBRT) for intermediate-risk prostate cancer using propensity score-matched analysis. From 2006 to 2011, 993 patients diagnosed with intermediate-risk were treated with either SEED-BT alone (n = 775) or SEED-BT plus EBRT (n = 158) at 3 tertiary hospitals.

In the propensity score-matched analysis (102 pairs), median follow-up was 95 months (range 18–153 months). The 8-year biochemical recurrence-free rate (bRFR) was significantly better with SEED-BT alone than with combined radiotherapy (93.3% vs. 88.4%; HR 0.396; 95% CI 0.158–0.991).

Grade 2 or greater late genitourinary toxicities were significantly fewer with SEED-BT alone than with combined radiotherapy (21.0% vs. 33.2%; HR 0.521; 95% CI 0.308–0.881). Similarly, grade 2 or greater late gastrointestinal toxicities were significantly fewer with SEED-BT alone (0% vs. 12.2%; HR 0.125; 95% CI 0.040–0.390). For the unfavorable intermediate-risk subgroups, SEED-BT alone yielded a significantly better bRFR than the combined radiotherapy (HR 0.325; 95% CI 0.115–0.915). SEED-BT alone might be a better disease-management plan than SEED-BT plus EBRT for intermediate-risk prostate cancer

regardless of favorable and unfavorable characteristics. Permanent seed brachytherapy (SEED-BT) has taken a place alongside external-beam radiotherapy (EBRT) and radical prostatectomy as one of the definitive therapeutic options for treating intermediate-risk prostate cancer. The most appealing reasons for selecting this treatment are favorable disease control rates and acceptable side effect profiles–Prostate brachytherapy for patients with intermediate-risk disease has conventionally used a combination of SEED-BT and EBRT rather than SEED-BT alone7,especially if unfavorable factors such as a higher Gleason score and higher-volume disease are present. Although the ASCENDE-RT (Androgen Suppression Combined with Elective Nodal and Dose Escalated Radiation Therapy) randomized trial demonstrated that a combination of SEED-BT and EBRT improved biochemical control over dose-escalated EBRT (78 Gy) alone in disease classified as high- and intermediate-risk, no current consensus has been reached about whether the combination of brachytherapy and EBRT provides a better clinical outcome over brachytherapy alone in intermediate risk prostate cancer. Some studies reported a biochemical control advantage for combined therapy. Others showed no biochemical control improvement for combined radiotherapy compared with SEED-BT alone.

Concluzii

The results of the present study imply that, compared with SEED-BT plus EBRT, SEED-BT alone might be a better disease-management plan for patients with intermediate-risk prostate cancer. Our resulting hypothesis is that adding EBRT to SEED-BT does not result in superior oncologic outcomes in intermediate-risk prostate cancer regardless of favorable and unfavorable characteristics. SEED-BT alone without NHT might provide a sufficiently high biochemical control rate in the treatment of intermediate-risk prostate cancer. A prospective evaluation of the role of SEED-BT alone is required to address that hypothesis and the current controversies with respect to the guidelines for patients with unfavorable intermediate-risk disease.

Articol 6

6. Elif Eda Ozer, Melisa Bagci, Esengul Kocak Uzel, Gulsen Pinar Soydemir, Metin Figen,

Meltem Kirli Bolukbas, Comparison of point a based plans with clinical target volume-based three-dimensional plans using dose–volume parameters in small lesion of cervical cancer brachyterapy, Eur. J. Gynaecol. Oncol. 2021 vol. 42(5), 936-942, http://doi.org/10.31083/j.ejgo4205141

Abstract

Objective: Intracavitary brachytherapy (ICBT) is the most critical part of cervical cancer treatment which contains a combination of external and intracavitary radiotherapy. We aimed to compare two different plans normalized to point A and the high-risk clinical target volume (HR-CTV) in terms of the target volume and doses for organs at risk (OARs).

Methods: Twenty-eight patients with small-residue cervical tumor volume who received CT-based brachytherapy treatment with uterus tandem and double ovoid applicators were included in the study. 3D-ICBT treatment plans normalized to HR-CTV and point A were applied separately to five fractions. We made a total of 280 plans for the two treatment techniques. The patients were given a dose of 5.5 Gy per fraction for a total of 27.5 Gy in 5 fractions. The doses to OAR (rectum, sigmoid, and bladder) and HR-CTV were compared between HR-CTV and point A - based plans.

Results: In the brachytherapy treatment planning, the mean doses of HR-CTV D90 and IR-CTV D100 were significantly lower in each fraction and in the total doses when normalized to HR-CTV than when normalized to point A ($p < 0.001$). D1*cc*, D2*cc*, and D*max* values of OAR doses obtained from the brachytherapy treatment planning were significantly lower in each fraction and in the total doses when normalized to HR-CTV than when normalized to point A ($p<0.001$).

Concluzii

Our findings show that particularly in small-volume HRCTV after EBRT, plans normalized to HR-CTV can reduce overdose in the target tissue and avoid unnecessary OAR irradiation compared to the plans normalized to point A. Today, plans should be evaluated according to 3D volumes in 3D-ICBT planning, even if there is a small tumor. Evaluating plans by looking

at traditional point A doses is losing its importance day by day with the increasing literature data.

Articol 7

Kasahara K, Inoue K, Karashima T, Inoue Y, Kariya S, Inomata T, Yoshida S, Shuin T., High-dose rate iridium-192 brachytherapy combined with external beam radiotherapy for localized prostate cancer, Nihon Hinyokika Gakkai Zasshi. 2001 Jul;92(5):572-8.doi: 10.5980/jpnjurol1989.92.572.

Abstract

(Purpose) We report our technique and also preliminary results in the cases with localized prostate cancer treated by the combination of high-dose rate Iridium-192 (HDR-Ir192) brachyterapy and external irradiation.

(Materials and Methods) From June 1999 to August 2000, 17 patients were treated by the combination of HDR-Ir 192 and external beam. The mean age of patients was 72 years (range, 48---81 years). The clinical stage was B1 in 5, B2 in 7 and C (no cancer with seminal vesicle) in 5 cases. Of 10 patients without neoadjuvant hormonal therapy, the median initial pretreatment PSA was 15. 3ng/ml (6. 93-222. 32ng/ml). The treatment was given by HDR-Ir 192 brachytherapy (6Gy X 3 times/2 days) and external beam irradiation (40 or 45Gy). The brachytherapy was given using TRUS guided percutaneously inserted temporary needles with a high dose rate remote afterloading control. Local control was evaluated by digital rectal examination, TRUS-guided biopsies and serum PSA evaluations.

Follow-up ranged from 2 to 14 months, with a median of 8 months.

(Results) In 4 (40. 0%) of 10 patients without neoadjuvant hormonal therapy the level of serum PSA was decreased to less than 4. 0 ng/ml within 3 months after the therapy. The effective grade in the biopsy specimens of 8 patients without neoadjuvant hormonal therapy was Grade Ob in 4, Grade 1 in 1, Grade 3 in 3 cases at 3 months after the therapy. No severe intra-or pen-operative complications occurred.

Concluzii

(Conclusion) The combined radiotherapy treatment is safe and effective for use in the patients with localized prostate cancer. However, more comprehensive studies involving long-term follow-up and great numbers of the cases with localized prostate cancer treated by the combination of HDR-Ir 192 brachytherapy and external irradiation will be necessary to determine whether this therapy contributes to better prognosis.

Articol 8

7. Fu-Lei Gao, Yong Wang, Xiang-Zhong Huang, Tian-Fan Pan, Jin-He Guo, I-125 seeds brachytherapy with transcatheter arterial chemoembolization for subcapsular hepatocellular carcinoma, BMC Gastroenterology (2022) 22:273, https://doi.org/10.1186/s12876-022-02356-0

Abstract

Background: I-125 seeds brachytherapy (ISB) has been used to improve the clinical effectiveness of transarterial chemoembolization (TACE) for hepatocellular carcinoma (HCC). We aim to appraise the safety and clinical efficacy of combined ISB and TACE for the treatment of subcapsular HCC.

Materials and methods: A retrospective investigative study extending from January 2017 to December 2020, involved individuals suffering from subcapsular HCC, who were subjected to TACE treatment with or without ISB in our center. The clinical effectiveness was compared between 2 groups.

Results: Sixty-four patients, in total, with subcapsular HCC had to undergo TACE with (n = 32) or without (n = 32) ISB in our center. After CT-guided ISB, only 2 (6.3%) patients experienced a self-limited pneumothorax. Combined treatment resulted in a significantly higher complete response (56.3% vs. 18.8%, *P* = 0.002) and total response (90.7% vs. 59.4%, *P* = 0.004) rates than that of TACE alone. In comparison to the TACE alone group, the median progressionfree survival was substantially longer in the combined treatment group (11 months vs. 5 months, *P* = 0.016). Further, 15 and 28 patients in combined and TACE alone groups respectively died

within the follow-up. The median OS was comparable between combined and TACE alone groups (22 months vs. 18 months, $P = 0.529$).

Conclusions: Combined TACE and ISB therapy is a safe treatment method for individuals suffering from subcapsular HCC. When compared, combined treatment had significantly enhanced clinical efficacy as a subcapsular HCC therapy, in comparison to TACE alone.

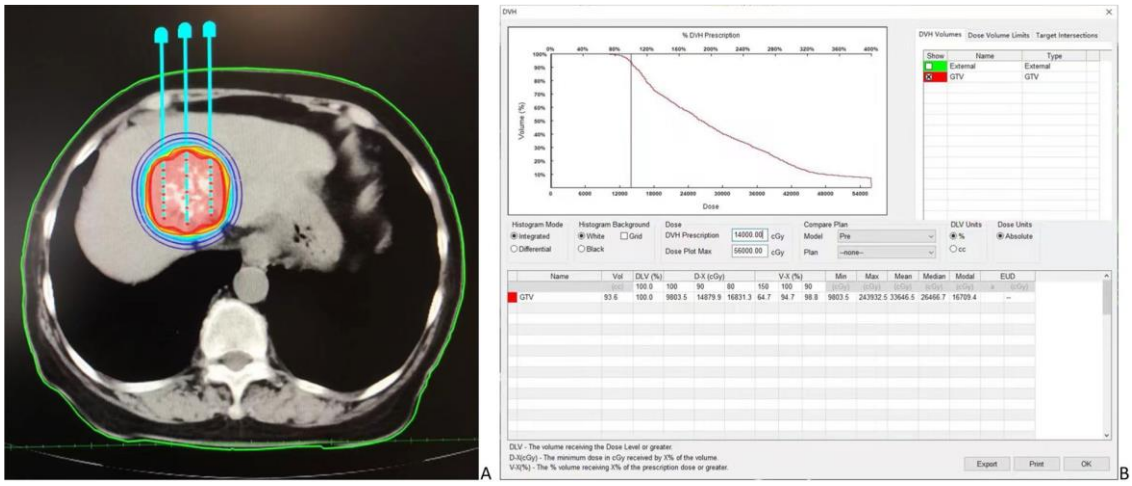

Fig. 2 The isodose curves a) plotted by the TPS and dose-volume histogram b)

Concluzii

Briefly, combination of TACE and ISB is a safe treatment method for subcapsular HCC. The clinical efficacy of combination treatment was significantly superior to TACE alone in the treatment of subcapsular HCC.