

BioXmark[®], manufactured by Nanovi Publications & Abstracts

Bladder Cancer

de Ridder M, Gerbrandy LC, de Reijke TM, Hinnen KA, Hulshof MCCM. BioXmark[®] liquid fiducial markers for image-guided radiotherapy in muscle invasive bladder cancer: a safety and performance trial. BJR. 2020 Jun 1;20200241. <https://pubmed.ncbi.nlm.nih.gov/32463291/>

de Ridder M, Gerbrandy LC, De Reijke TM, Hinnen KA, Hulshof MCCM. A novel liquid fiducial marker for image-guided adaptive radiotherapy in bladder cancer [poster at ESTRO 2020]. <https://www.estro.org/library/item/7004/a-novel-liquid-fiducial-marker-for-image-guided-adaptive-radiotherapy-in-bladder-cancer>

Hafeez S, Hansen VN, McNair H, Harris E, Jones K, Schmidt M, Kumar P, Huddart R. Assessing feasibility of a new fundicial marker (BioXmark) for bladder tumor localization and position verification during radical radiotherapy in a porcine phantom. Abstract 30th EUS Annual Meeting, New Orleans, LA, 2015 May 16. http://engineering-urology.org/am/30EUS_2015.pdf (Abstract 8; P: 22)

Lung Cancer

de Blanck SR, Rydhög JS, Larsen KR, Clementsen PF, Josipovic M, Aznar MC, af Rosenschöld PM, Jølck RI, Specht L, Andresen TL, Persson GF. Long term safety and visibility of a novel liquid fiducial marker for use in image guided radiotherapy of non-small cell lung cancer. Clinical and Translational Radiation Oncology. 2018 Nov; 13:24-8. <https://pubmed.ncbi.nlm.nih.gov/30258990/>

Scherman Rydhög J, Riisgaard de Blanck S, Josipovic M, Irming Jølck R, Larsen KR, Clementsen P, Lars Andersen T, Poulsen PR, Fredberg Persson G, Munck af Rosenschöld P. Target position uncertainty during visually guided deep-inspiration breath-hold radiotherapy in locally advanced lung cancer. Radiotherapy and Oncology. 2017 Apr;123(1):78-84. <https://www.ncbi.nlm.nih.gov/pubmed/28245908>

Rydhög JS, Mortensen SR, Larsen KR, Clementsen P, Jølck RI, Josipovic M, Aznar MC, Specht L, Andresen TL, Rosenschöld PM af, Persson GF. Liquid fiducial marker performance during radiotherapy of locally advanced non small cell lung cancer. Radiotherapy and Oncology. 2016 Oct;121(1):64-9. <https://pubmed.ncbi.nlm.nih.gov/27443450/>

Rydhög Scherman J, Perrin R, Jølck RI, Gagnon-Moisan F, Larsen KR, Clementsen P, Riisgaard de Blanck S, Fredberg Persson G, Weber DC, Lomax T, Andresen TL, Munck af Rosenschöld P. Liquid fiducial marker applicability in proton therapy of locally advanced lung cancer. Radiotherapy and Oncology. 2017 Mar;122(3):393-9. <https://pubmed.ncbi.nlm.nih.gov/28104299/>

Scherman JR, Irming Jølck R, Andresen TL, Munck af Rosenschöld P. Quantification and comparison of visibility and image artifacts of a new liquid fiducial marker in a lung phantom for image-guided radiation therapy: A new liquid fiducial marker for IGRT. Med Phys. 2015 May 15;42(6Part1):2818-26. <https://www.ncbi.nlm.nih.gov/pubmed/26127034>

Development of Technology

Wang W, Hansen AE, Sun H, Fliedner FP, Kjaer A, Jensen AI, Andresen TL, Henriksen JR. Carbohydrate based biomarkers enable hybrid near infrared fluorescence and ⁶⁴ Cu based radio-guidance for improved surgical precision. *Nanotheranostics*. 2021;5(4):448-60. <https://pubmed.ncbi.nlm.nih.gov/34055574/>

Hansen AE, Henriksen JR, Jølcck RI, Fliedner FP, Bruun LM, Scherman J, Jensen AI, Munck Af Rosenschöld P, Moorman L, Kurbegovic S, de Blanck SR, Larsen KR, Clementsen PF, Christensen AN, Clausen MH, Wang W, Kempen P, Christensen M, Viby NE, Persson G, Larsen R, Conradsen K, McEvoy FJ, Kjaer A, Eriksen T, Andresen TL. Multimodal soft tissue markers for bridging high-resolution diagnostic imaging with therapeutic intervention. *Sci Adv*. 2020 Aug 19;6(34) <https://pubmed.ncbi.nlm.nih.gov/32875113/>

Bertholet J, Knopf A, Eiben B, McClelland J, Grimwood A, Harris E, Menten M, Poulsen P, Nguyen DT, Keall P, Oelfke U. Real-time intrafraction motion monitoring in external beam radiotherapy. *Phys Med Biol*. 2019 Aug;64(15):15TR01. <https://pubmed.ncbi.nlm.nih.gov/31226704/>

Troost E, Menkel S, Enghardt W, Hytry J, Kunath D, Makocki S, Hoffmann A, Jølcck R. EP-1710: Chemical stability of BioXmark® following normofractionated and single-fraction proton beam therapy. *Radiotherapy and Oncology*. 2017 May 1;123:S937-8 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6871657/>

Rydhög JS, Jølcck RI, Andresen TL, Rosenschöld PM af. PO-0964: Artefact quantification of liquid and solid fiducial marker in single and dual energy CT with MAR. *Radiotherapy and Oncology*. 2015 Apr 1;115: S510. <http://nanovi.com/wp-content/uploads/2021/08/Rydhog-J-et-al.-poster.pdf>

Evaluation of Safety and Feasibility of BioXmark

Brown KH, Ghita M, Schettino G, Prise KM, Butterworth KT. Evaluation of a Novel Liquid Fiducial Marker, BioXmark®, for Small Animal Image-Guided Radiotherapy Applications. *Cancers (Basel)*. 2020 May 18;12(5):1276. doi: 10.3390/cancers12051276. <https://pubmed.ncbi.nlm.nih.gov/32443537/>

Mortensen SR, Scherman JB, Larsen KR, Jølcck RI, Persson GF, Hansen AE, Eriksen T, Specht L. Use of a Novel Liquid Fiducial Marker Injected with Endoscopic Ultrasound Equipment for Use in Image Guided Radiation Therapy of Thoracic Tumors (Porcine Model). *International Journal of Radiation Oncology Biology Physics*. 2014 Sep 1;90(1): S651. [http://www.redjournal.org/article/S0360-3016\(14\)02577-2/abstract](http://www.redjournal.org/article/S0360-3016(14)02577-2/abstract)

Hamming VC, Brouwer CL, Van Goethem MJ, Jolck RI, Van Leijsen C, Van den Bergh ACM. PO-0866: Visibility, image artifacts and proton dose perturbation of fiducial markers. *Radiotherapy and Oncology*. 2017 May;123:S471-2. [https://www.thegreenjournal.com/article/S0167-8140\(17\)31303-8/pdf](https://www.thegreenjournal.com/article/S0167-8140(17)31303-8/pdf)

Eriksen T, Mauldin N, Dickinson R, Mauldin G. Single high-dose radiation therapy and liquid fiducial markers can be used in dogs with incompletely resected soft tissue sarcomas. *J Am Vet Med Assoc*. 2023 Jul 12;261(10):1-8. doi: 10.2460/javma.23.02.0119. <https://pubmed.ncbi.nlm.nih.gov/37437890/>