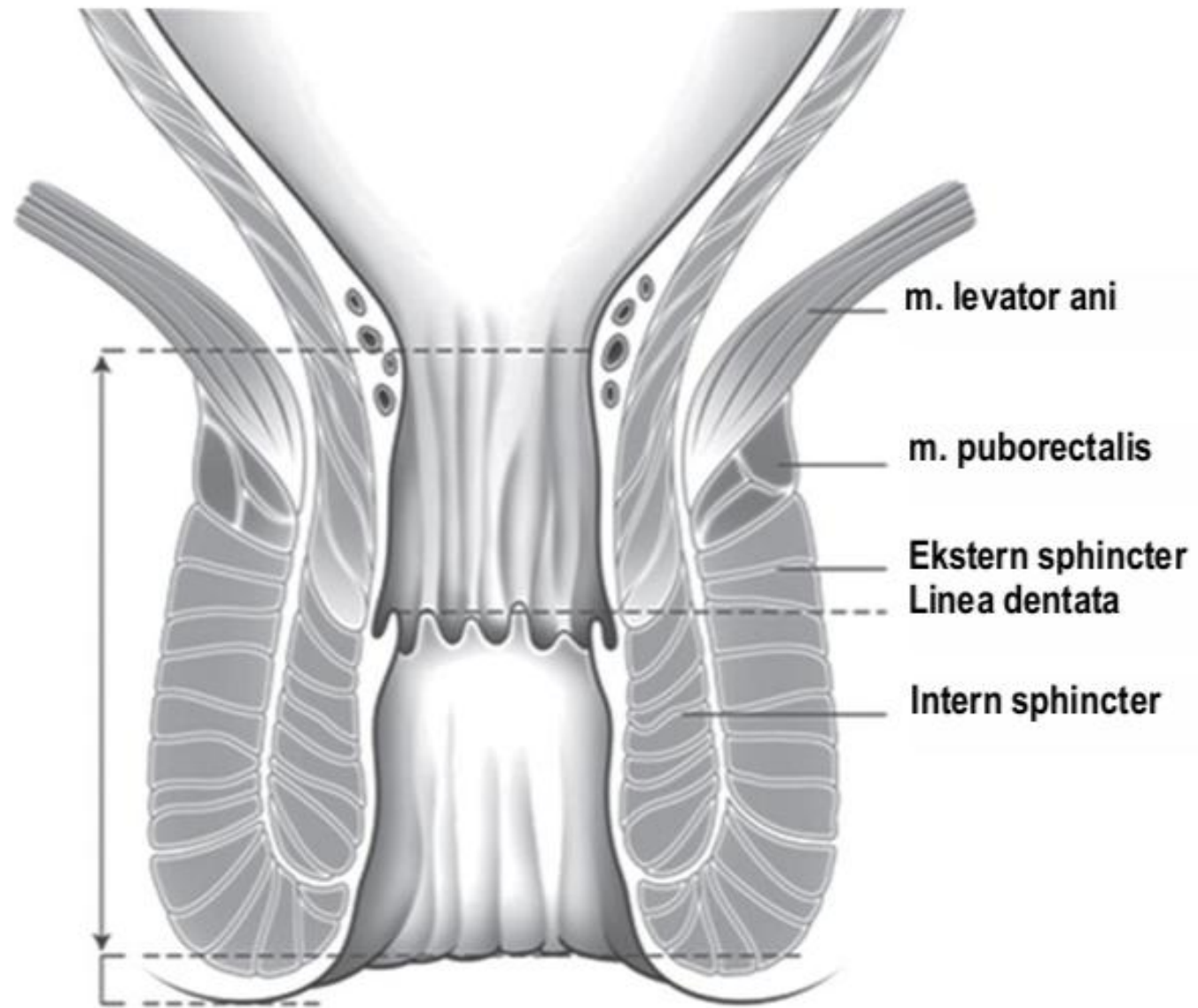


Imaging anal cancer - Staging and Follow-up

EANM and ESGAR

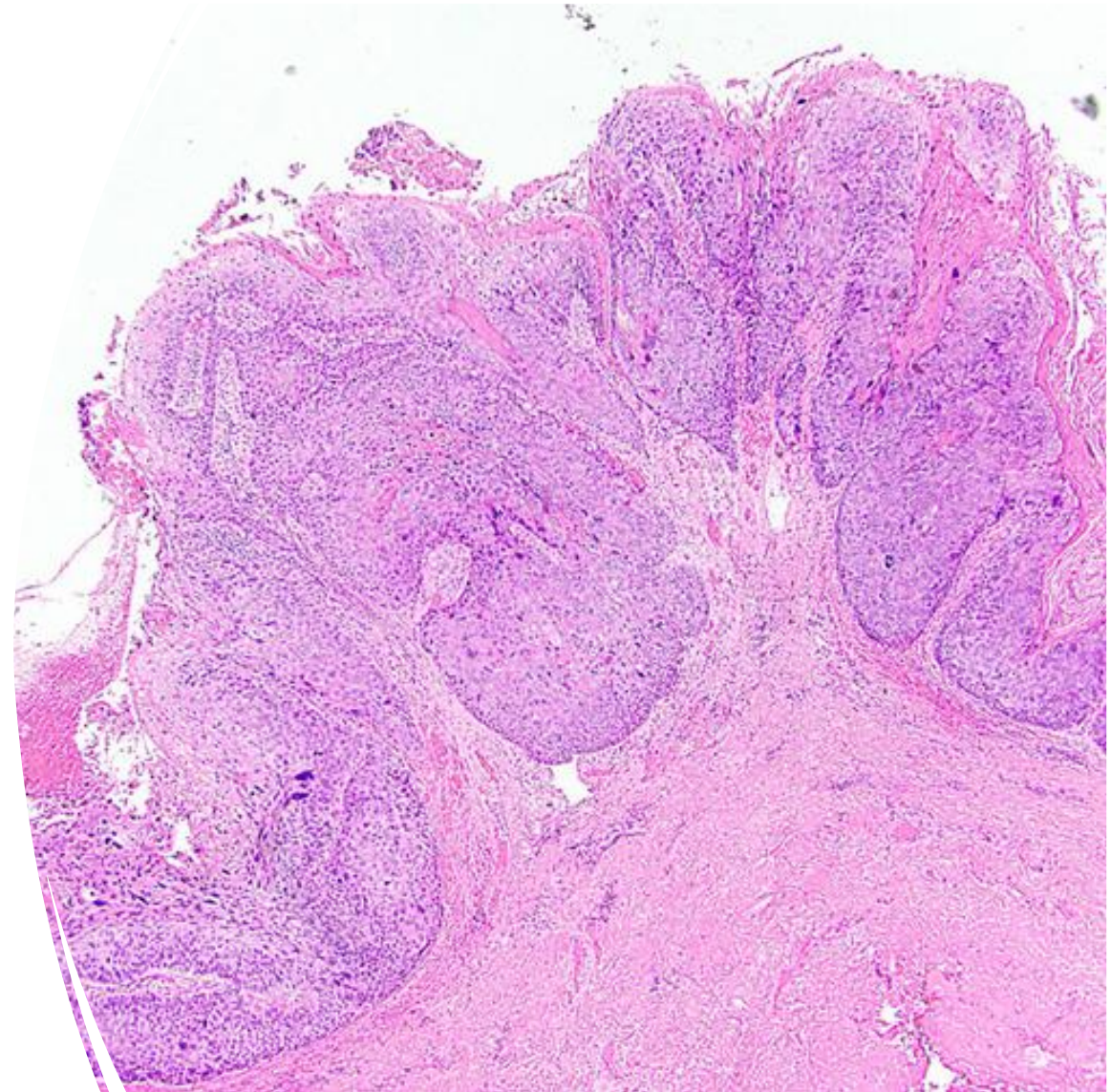
Søren Rafaelsen, Professor
Department of Radiology
Vejle Hospital, SLB
University of Southern Denmark





Anal Cancer

-
- Squamous Cell Cancer of the Anal Canal
 - Associated with HPV infection(Human Papilloma Virus)
 - Can be confused with hemorrhoids, fistulas or fissures
 - Centralized
 - MDT (multidisciplinary team conference)





Over the past 30 years, the incidence of **anal cancer** among US **women** has doubled

with current rates significantly higher than men at 2.52 versus 1.26 per 100000 people, respectively.

Anal cancer and anal cancer precursors in women with a history of HPV-related dysplasia and cancer.

Stier EA, Chiao EY.

Semin Colon Rectal Surg. 2017;28:97-101.

Anal cancer in high-risk women: the lost tribe.

Lupi M, Brogden D, Howell AM, Tekkis P, Mills S, Kontovounisios C.

Cancers (Basel). 2022;15:60.

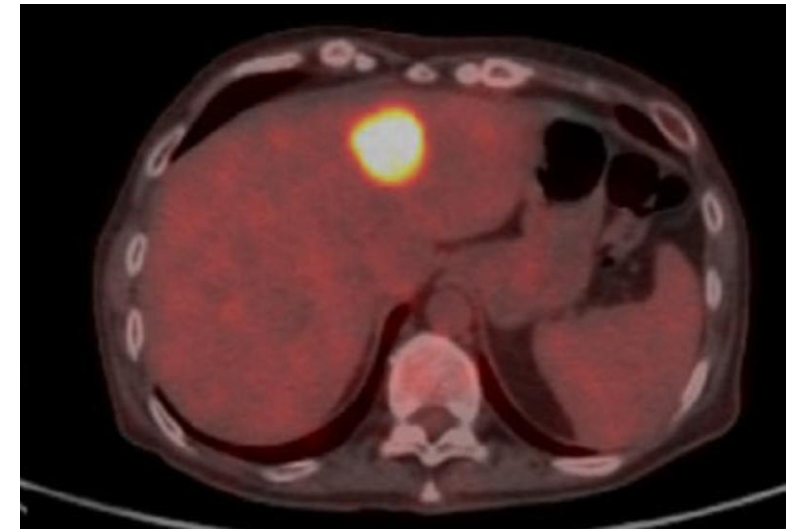
The incidence of ASCC has been increasing by 2%–3% every year.

Squamous cell carcinoma of the anus

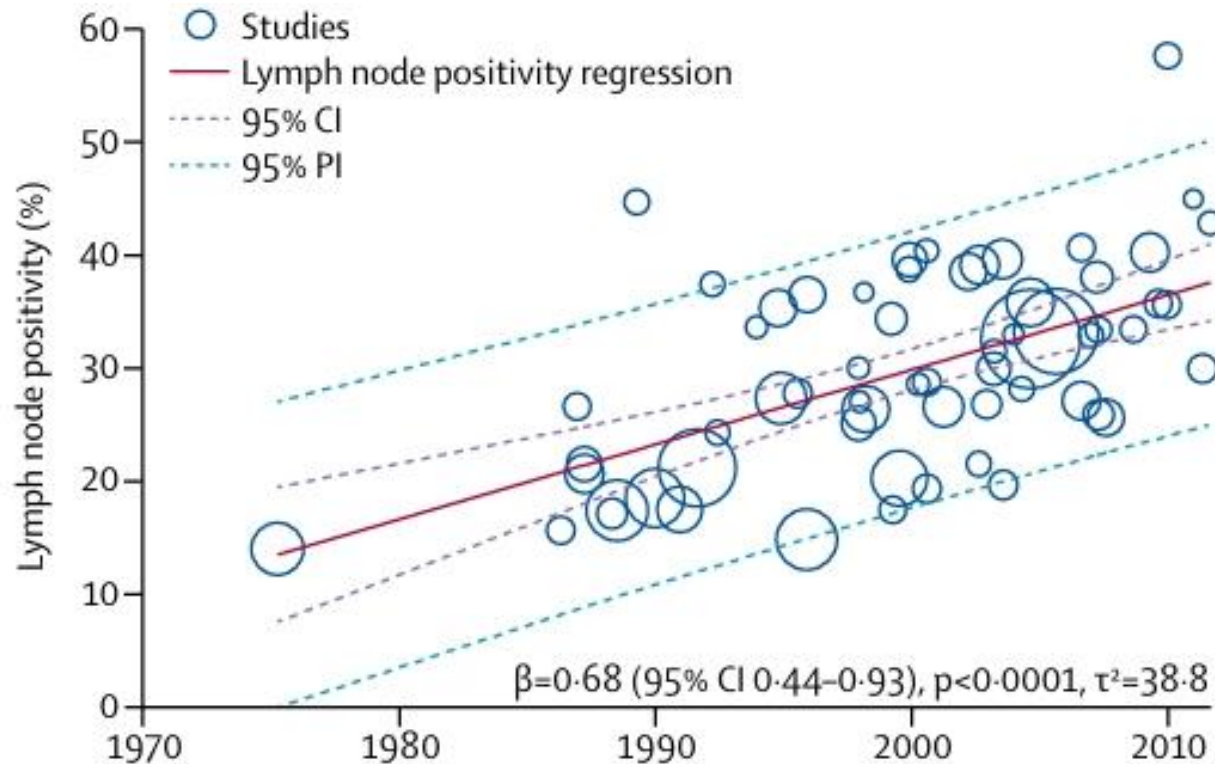
At time of diagnosis, most cases of anal cancer are at a localised stage with only **5–8% having distant metastases**

Glynne-Jones R., Nilsson P.J., Aschele C., Goh V., Peiffert D., Cervantes A., Peiffert D., Arnold D.
Anal cancer: ESMO-ESSO-ESTRO clinical practice guidelines for diagnosis, treatment and follow-up.
Radiother. Oncol. 2014;111:330–339.

Rogers J.E., Eng C.
Pharmacotherapy of Anal Cancer.
Drugs. 2017;77:1519–1530.



Five-year overall survival (OS) has increased



: 58% - 71%] in 1980

Nodal stage migration and prognosis in anal cancer: a systematic review, meta-regression, and simulation study

Hema Sekhar, Marcel Zwahlen, Sven Trelle, Lee Malcomson, Rohit Kochhar, Mark P Saunders, Matthew Sperrin, Marcel van Herk, David Sebag-Montefiore, Matthias Egger, Andrew G Renehan

10% lymph node positivity every 10 years.

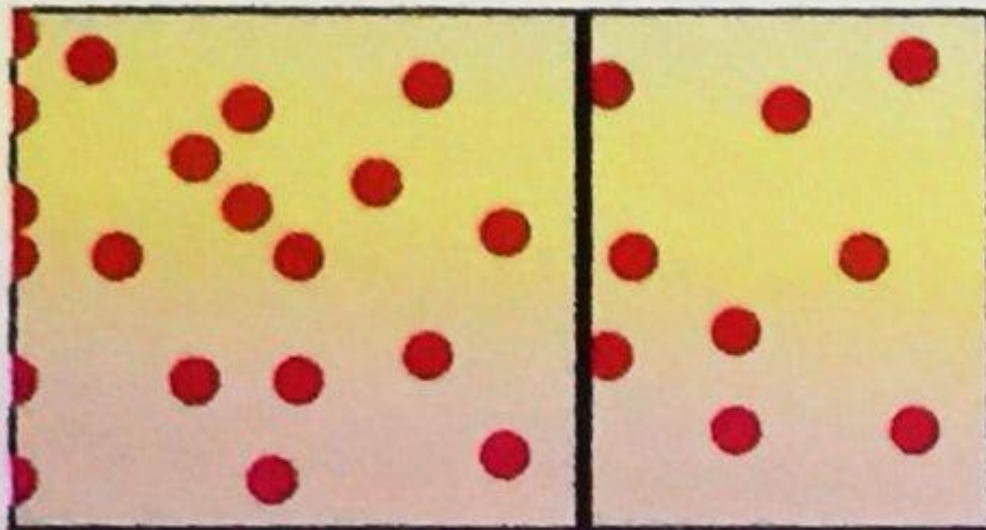
Nodal stage migration and prognosis in anal cancer: a systematic review, meta-regression, and simulation study.
Lancet Oncol. 2017;18(10):1348-1359.

When the Okies left Oklahoma and moved to California, they raised the average intelligence level in both states.” – Will Rogers.

Stage migration: The “Will Rogers” phenomenon

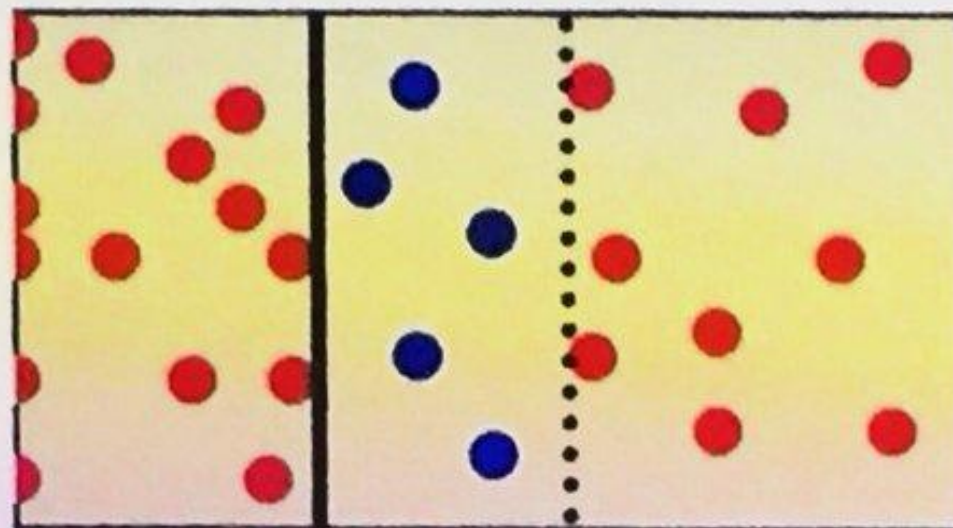
Old staging procedure

Early stage Late stage



New staging procedure

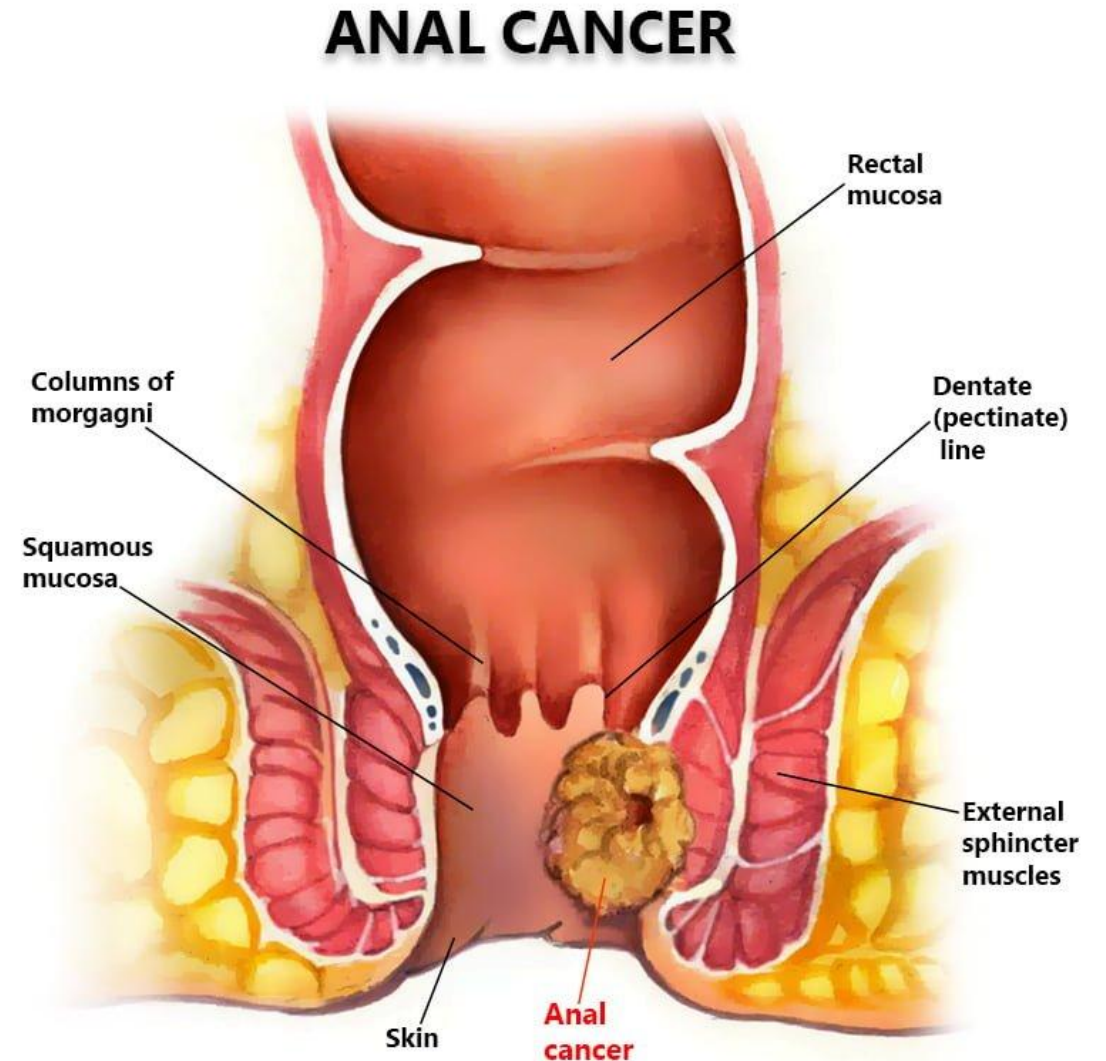
Early stage Late stage



Survival

3 sub-goals for initial staging of patients with anal cancer

- T - stage
- N – stage
- M - stage



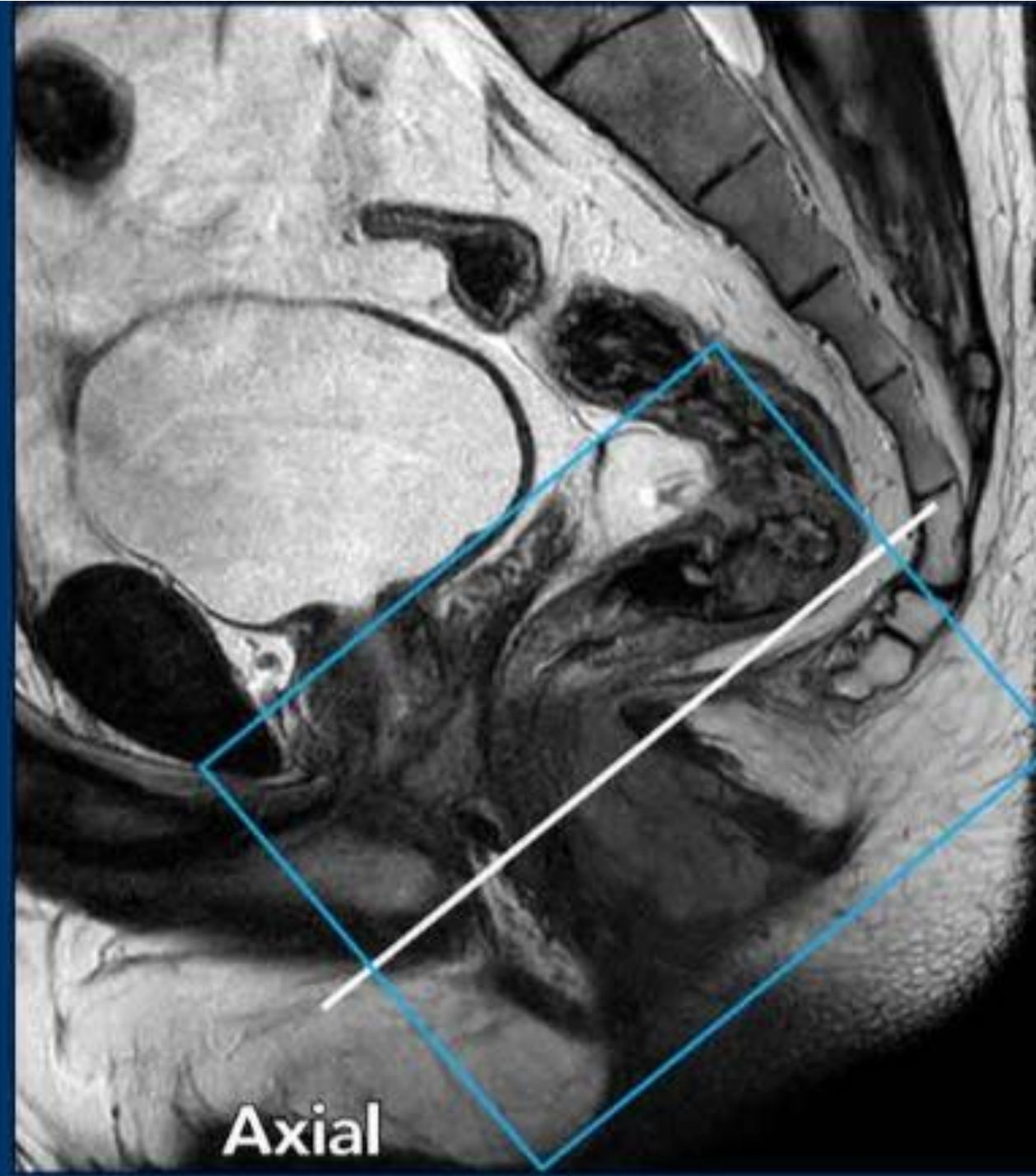
T stage

MRI remains the **gold standard** for **local staging** because of its superior soft- tissue contrast and ability to evaluate sphincter and mesorectal involvement.

T Category	T Criteria
TX	Primary tumor could not be evaluated
T0	No evidence of primary tumor
Tis	High-grade squamous intraepithelial lesion , carcinoma in-situ
T1	Tumor $\leq$ 2cm
T2	Tumor $>$ 2cm, $\leq$ 5cm
T3	Tumor $>$ 5cm
T4	Invasion regardless of Tumor Size (vagina, urethra, or bladder)

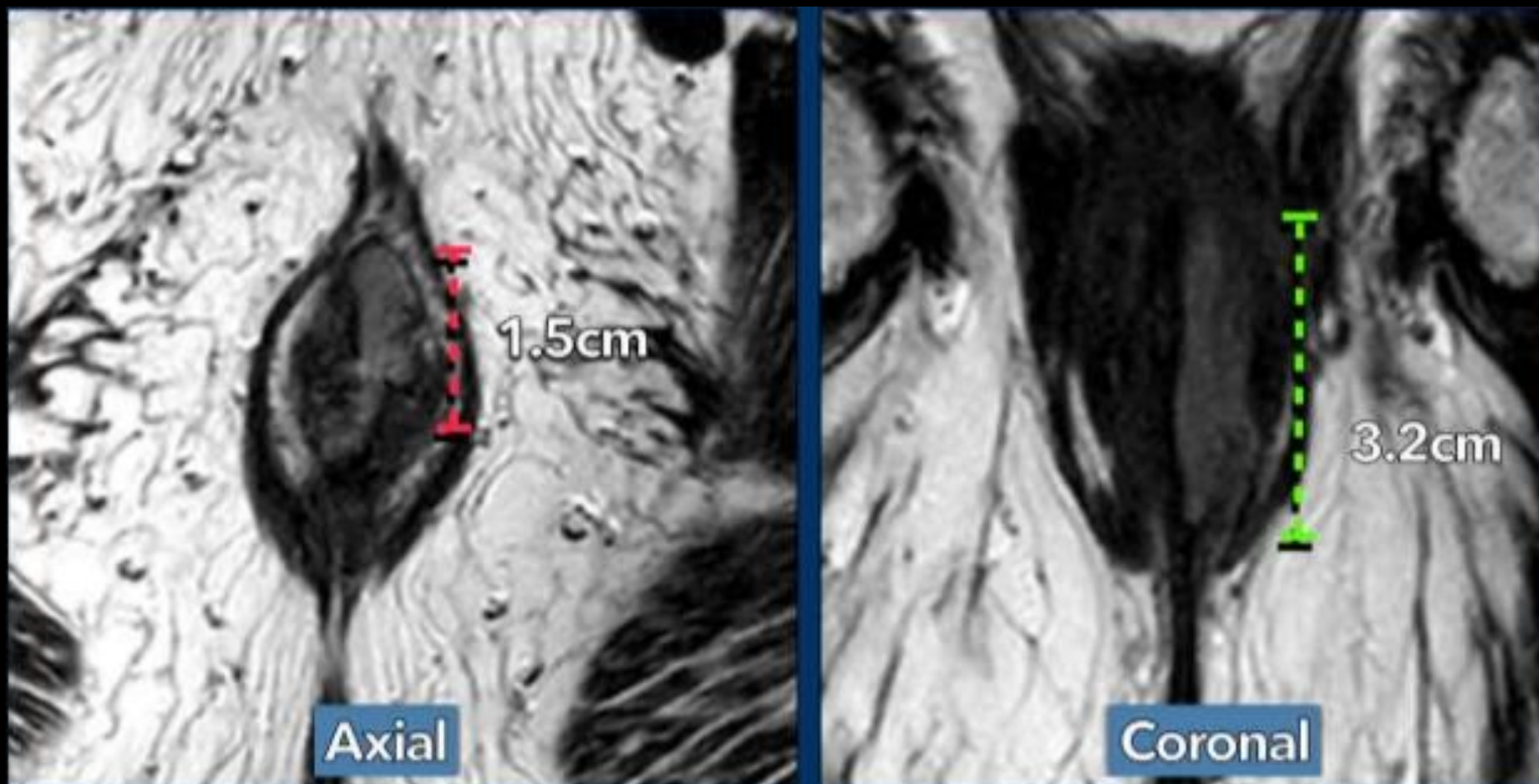
Anal Cancer: Clinical examination

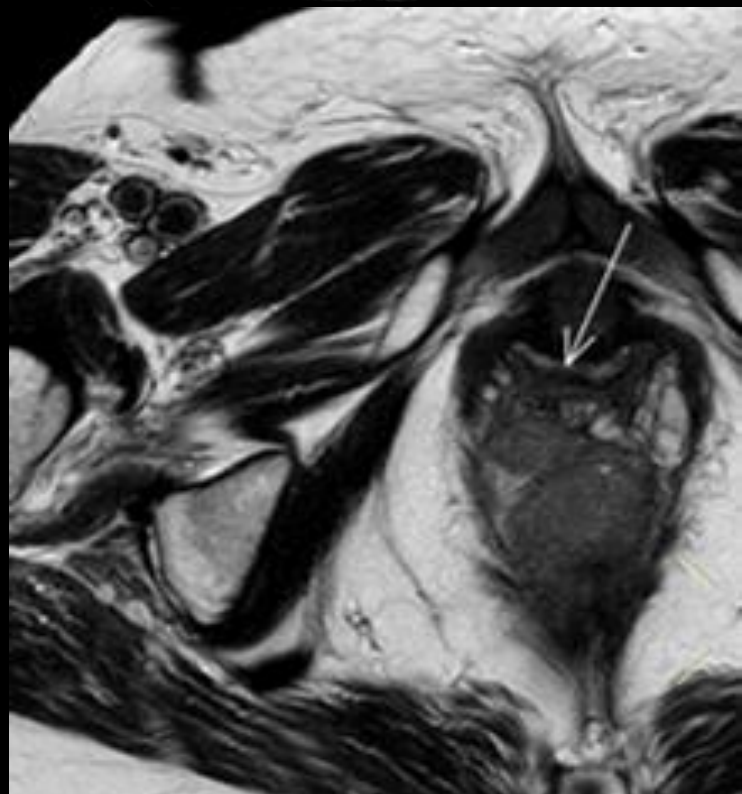
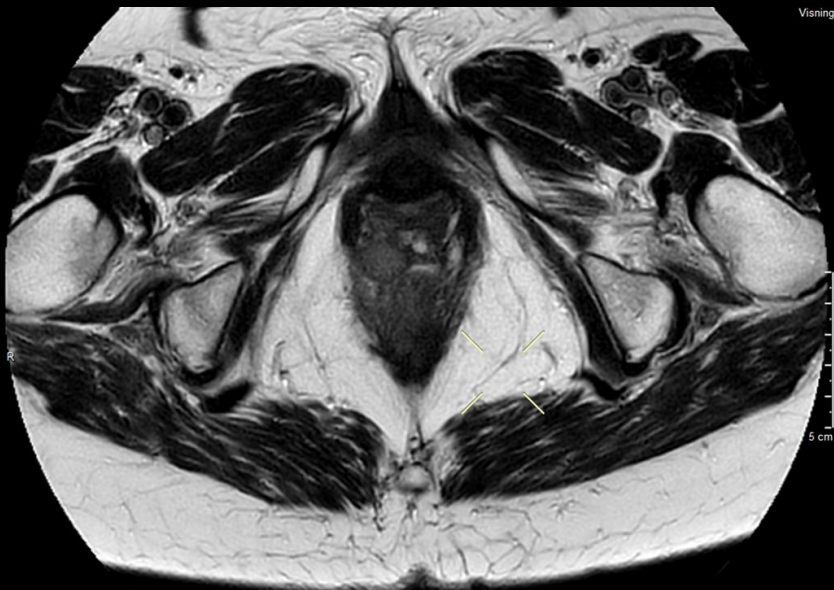
- Anal inspection
- Rectal exploration
- Anoscopy
- Groin palpation
- Gynecological examination
- Biopsy



T1

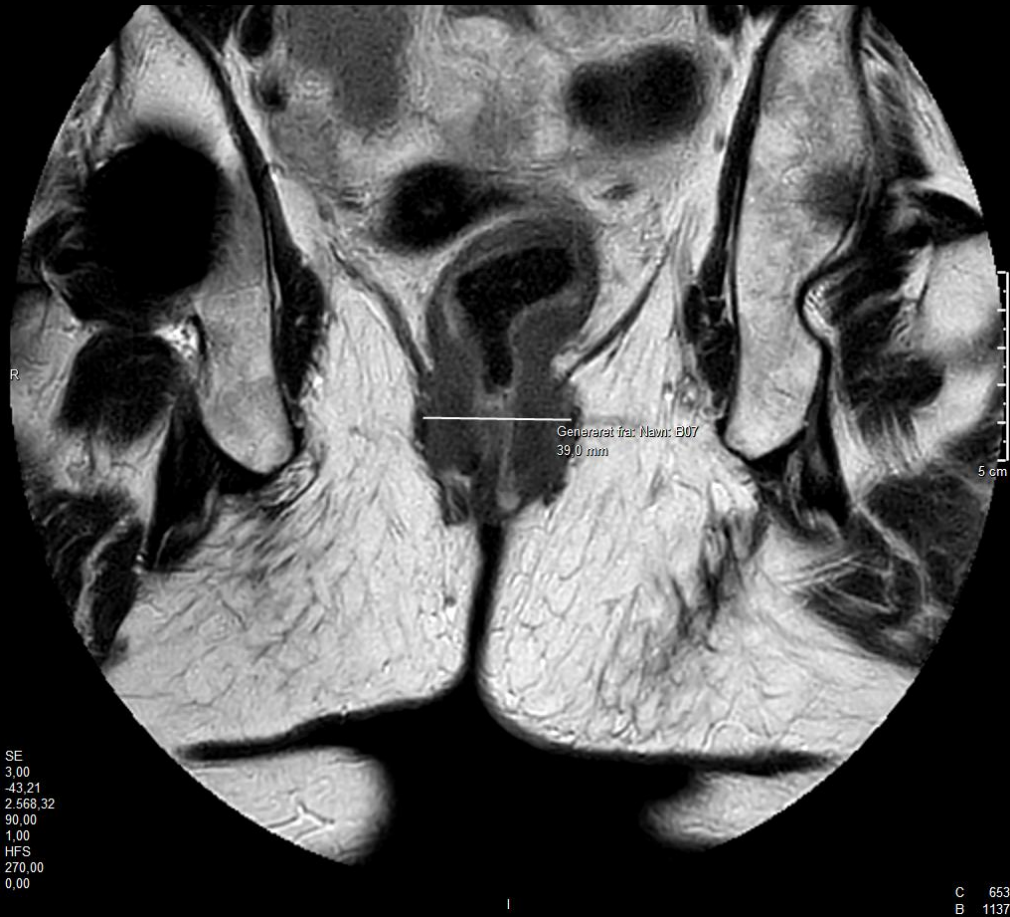
T2

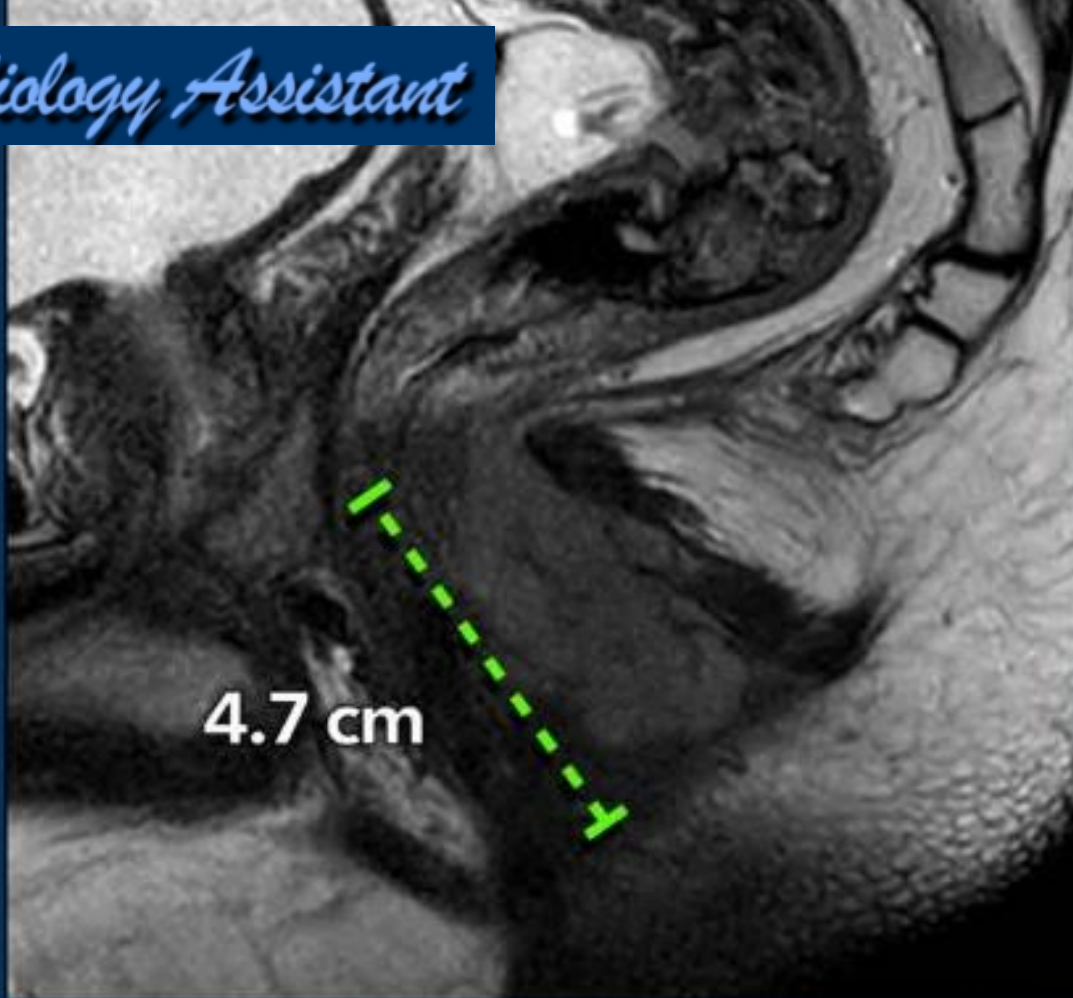




T4 vagina

cT4





Anal cancer staging

Monique Maas and Doenja Lambregts

Radiology department of the Netherlands Cancer Institute Amsterdam



This example shows a tumor with a maximal diameter of 4.7 cm. On the axial view the tumor involves the internal sphincter from 4-8 o'clock. It extends into the intersphincteric plane and invades the levator ani on the right dorsal side (arrow). In case of anal cancer this is staged as T2 (diameter 2-5 cm), while in case of a rectal cancer, the invasion of the external sphincter and levator ani would constitute a T4 stage.

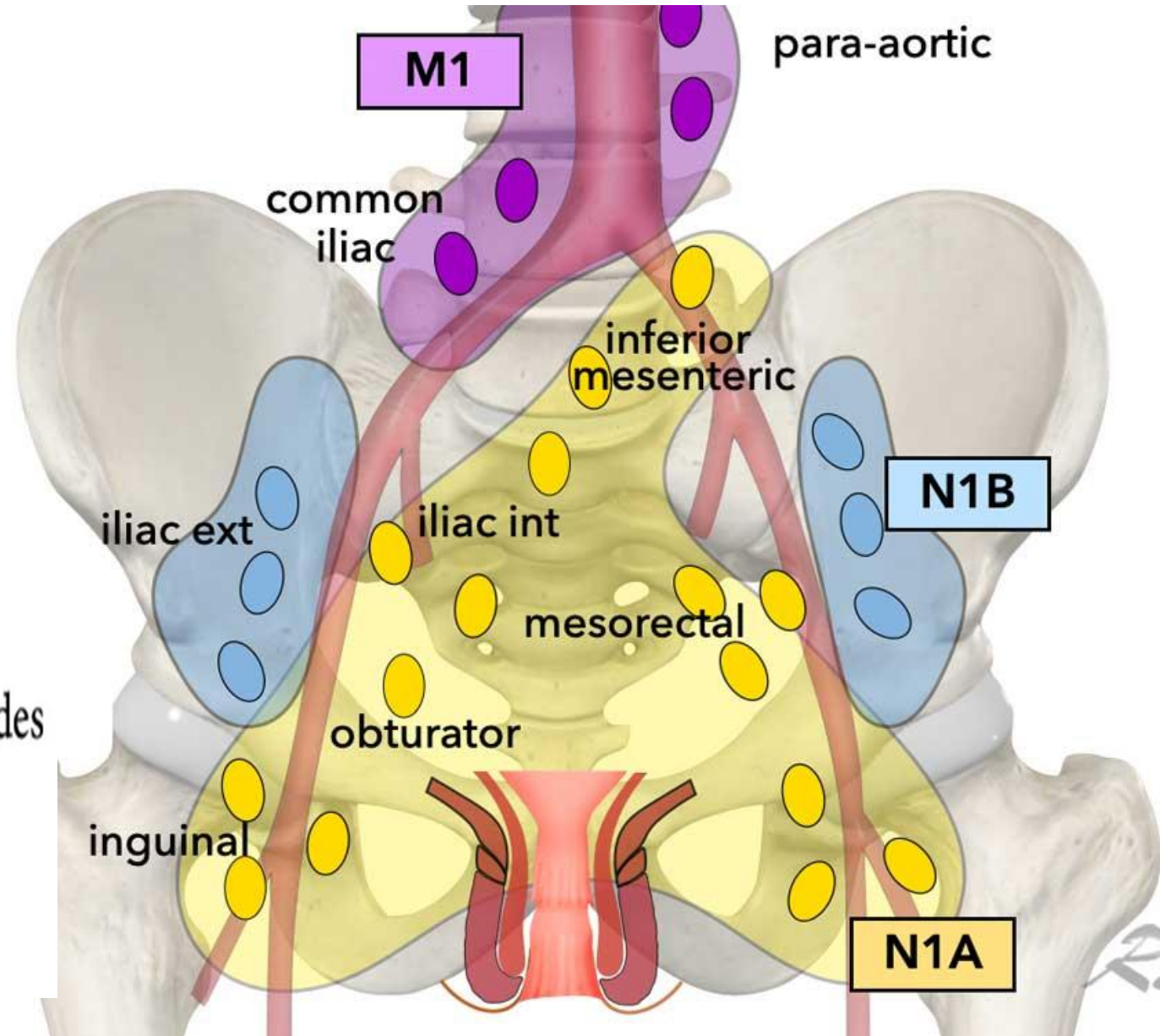
N stage

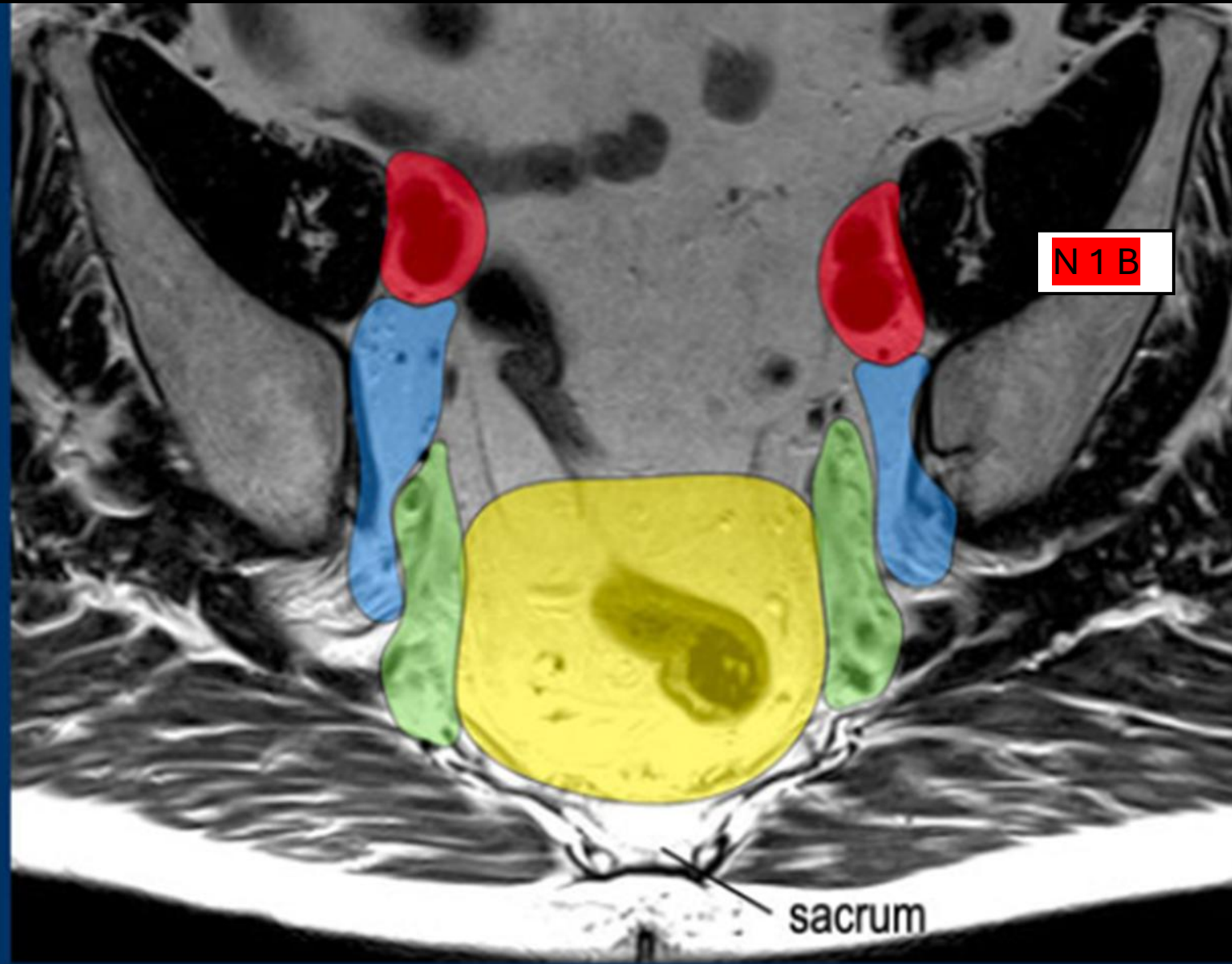
- In 25% to 45% of patients with anal cancer, lymph node metastases are present at the time of diagnosis
- Criteria for lymph node metastases
 - short axis > 1 cm for mesorectal lymph nodes
 - > 1.5 cm for inguinal lymph nodes
 - Round, heterogeneity, and irregular demarcation

N stage

$$N1A + N1B = N1C$$

- | | |
|-----|---|
| N1a | Inguinal, Mesorectal, or Internal iliac lymph nodes |
| N1b | External iliac lymph nodes |
| N1c | External iliac lymph nodes with N1a |



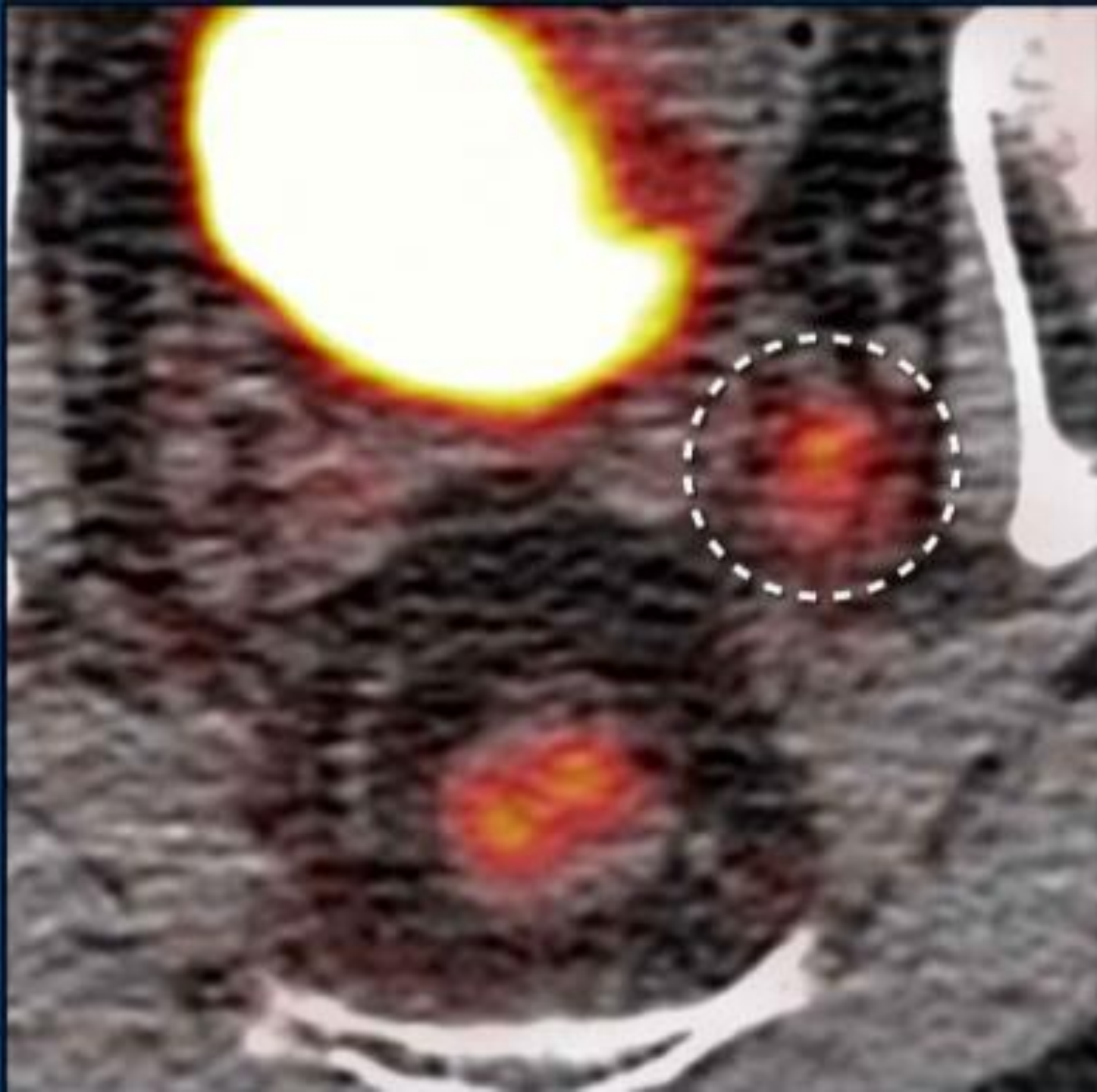
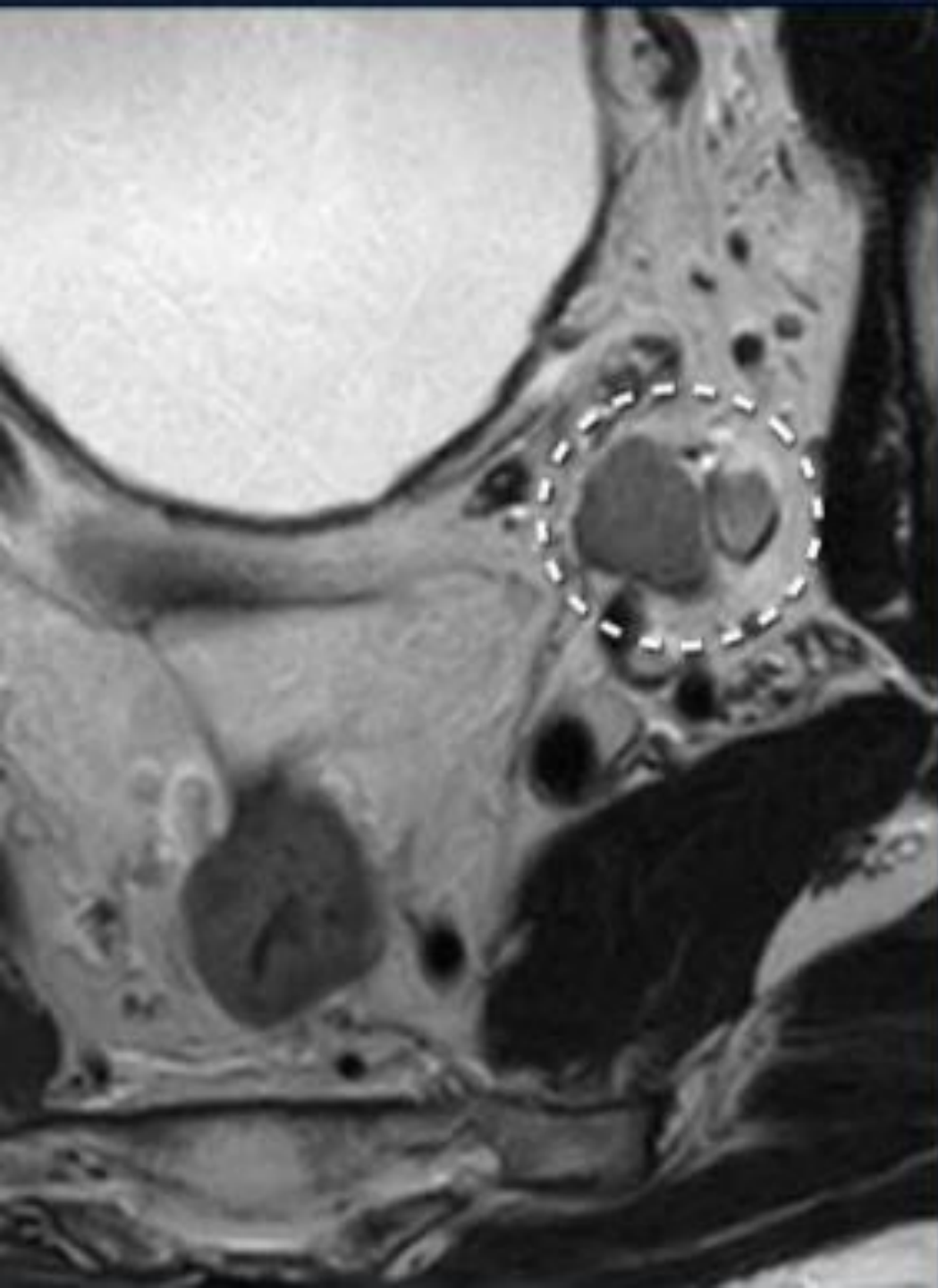


external iliac

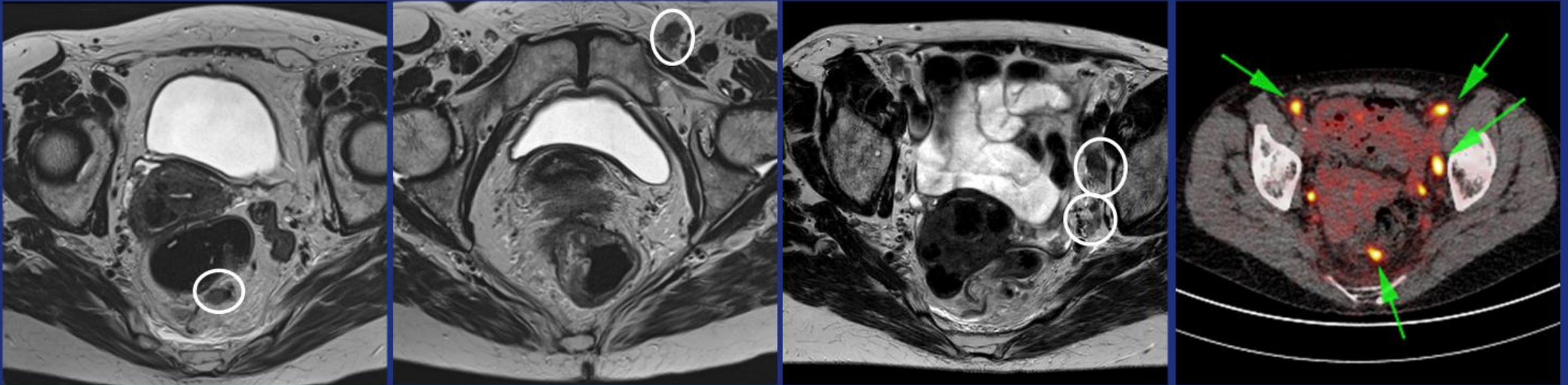
obturator

internal iliac

mesorectal

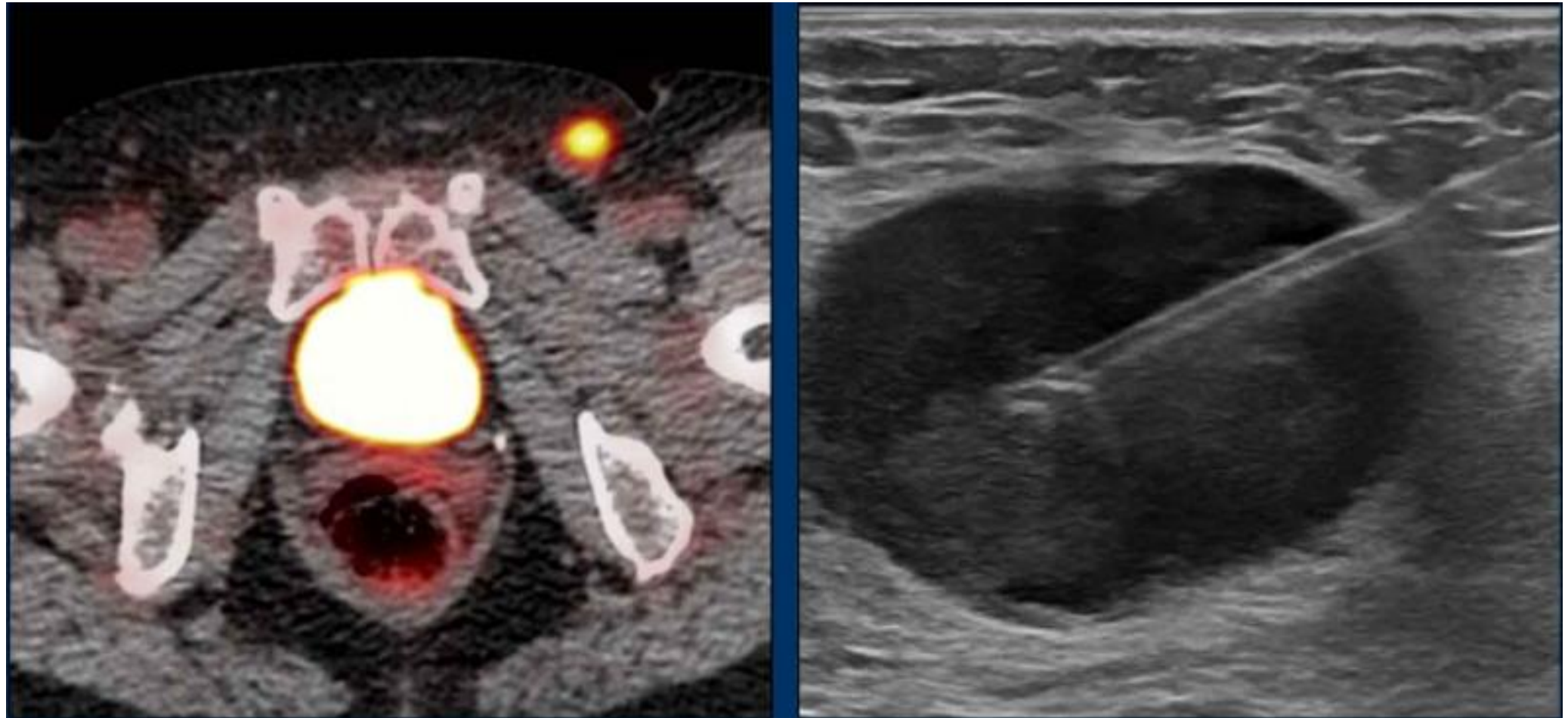


What about FDG-PET-CT?



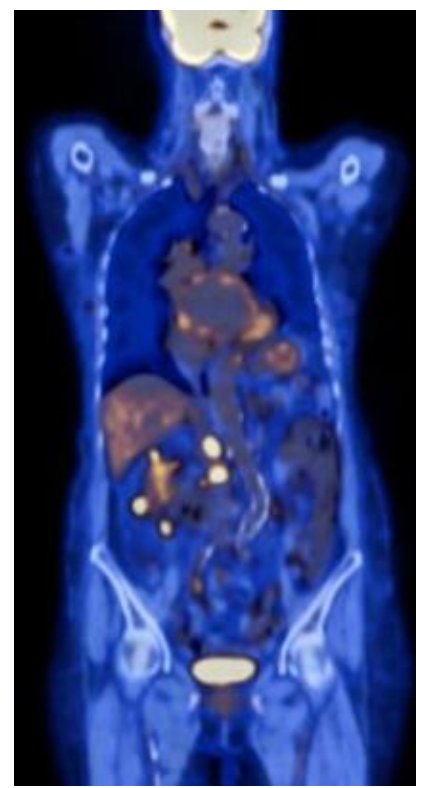
Sensitivity / specificity for FDG-PET-CT for nodes and/or distant metastasis = 100% / 95%

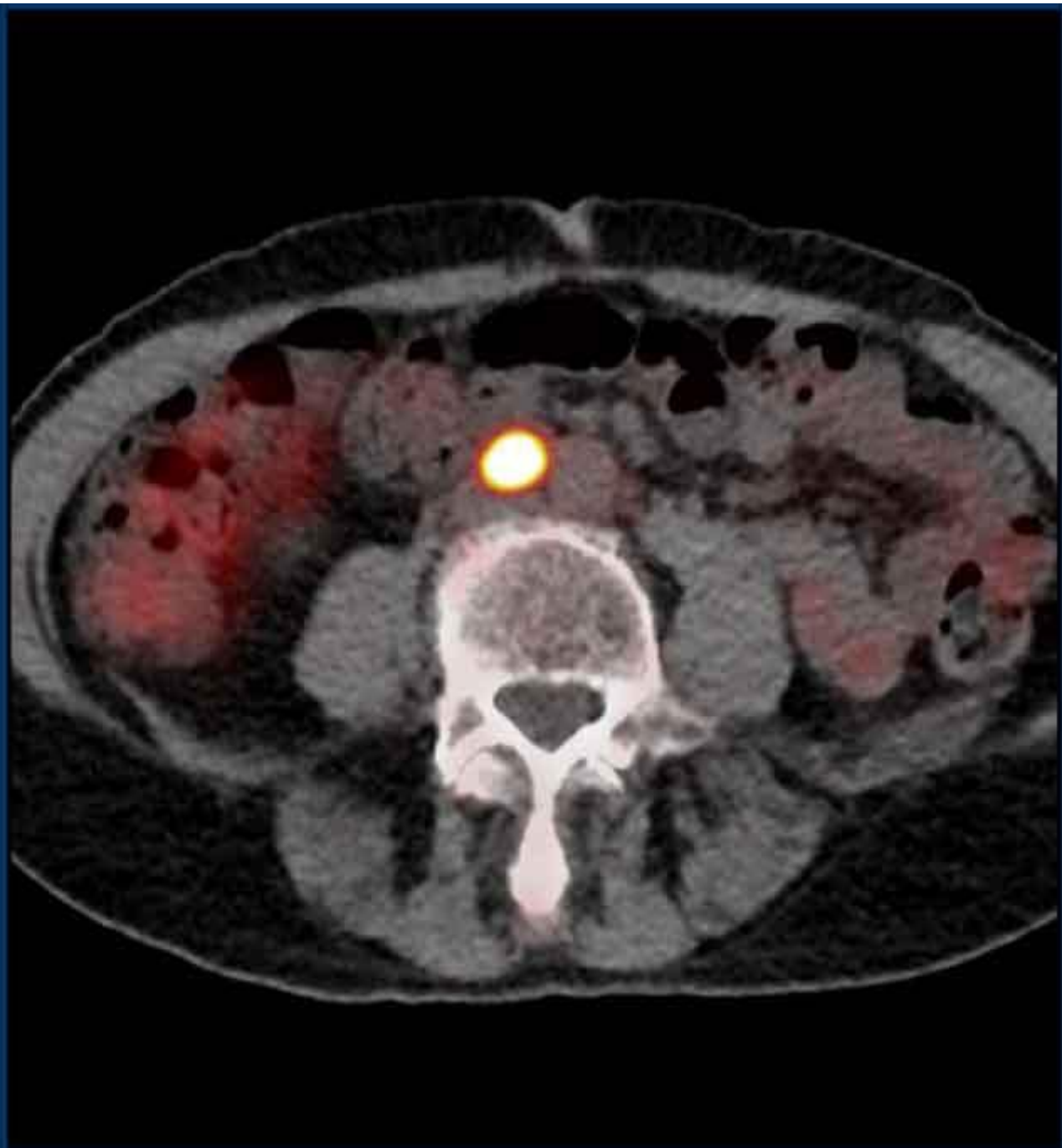
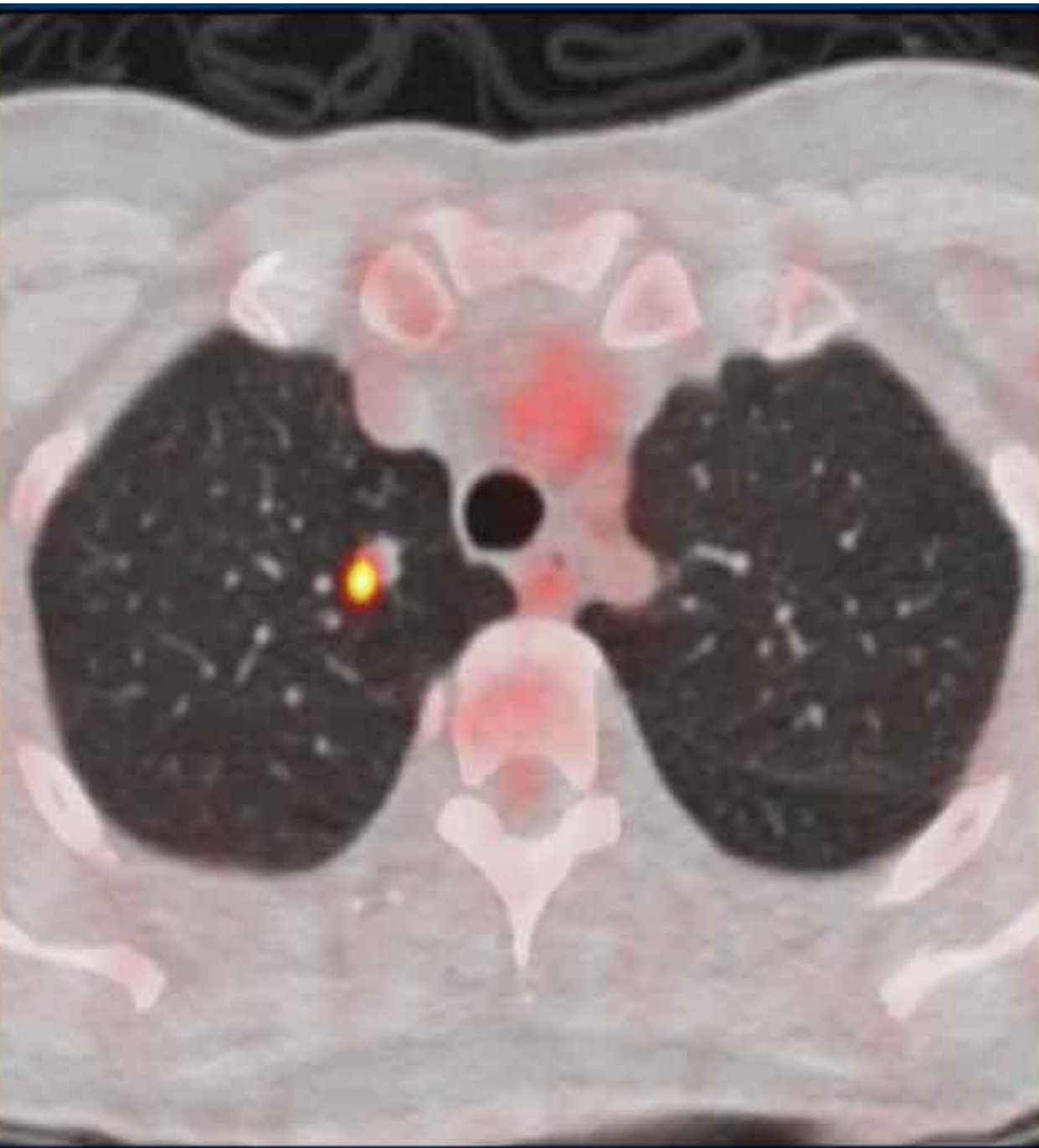
Short axis > 1.5 cm



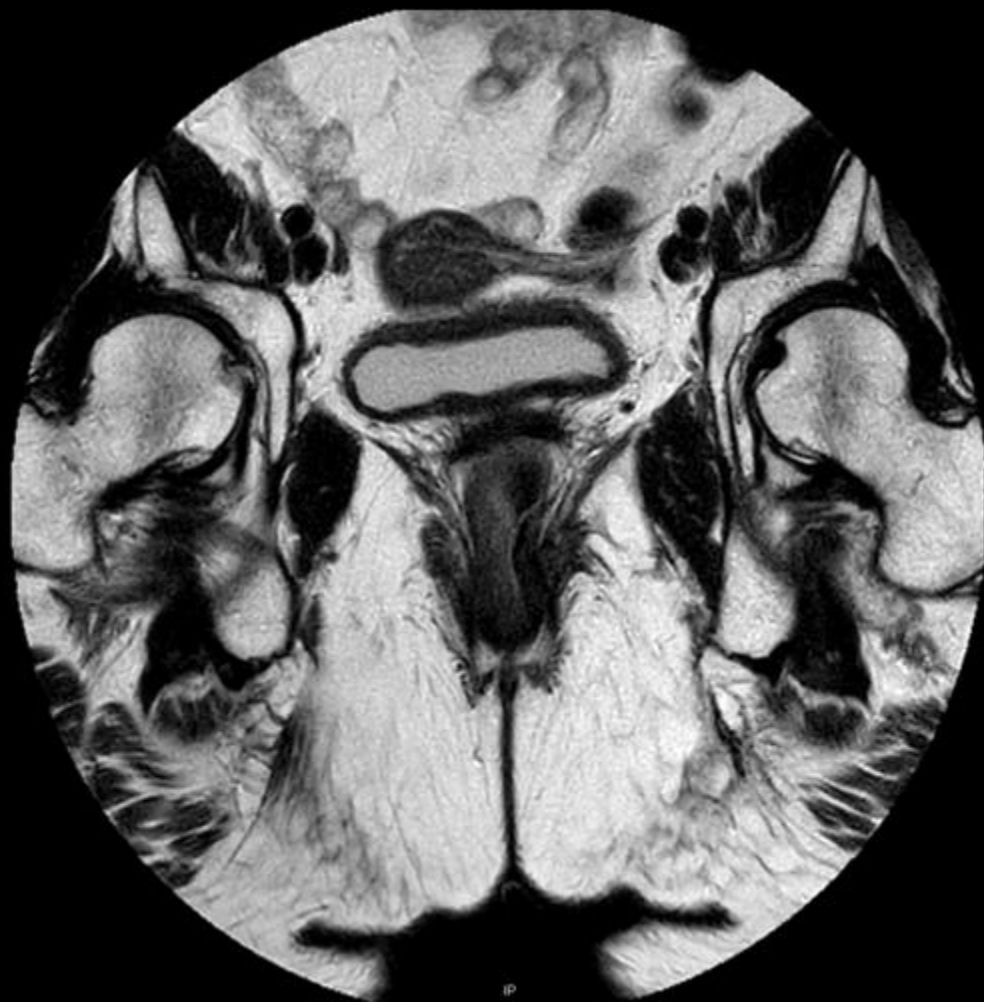
^{18}F -FDG PET/CT is used for diagnosis

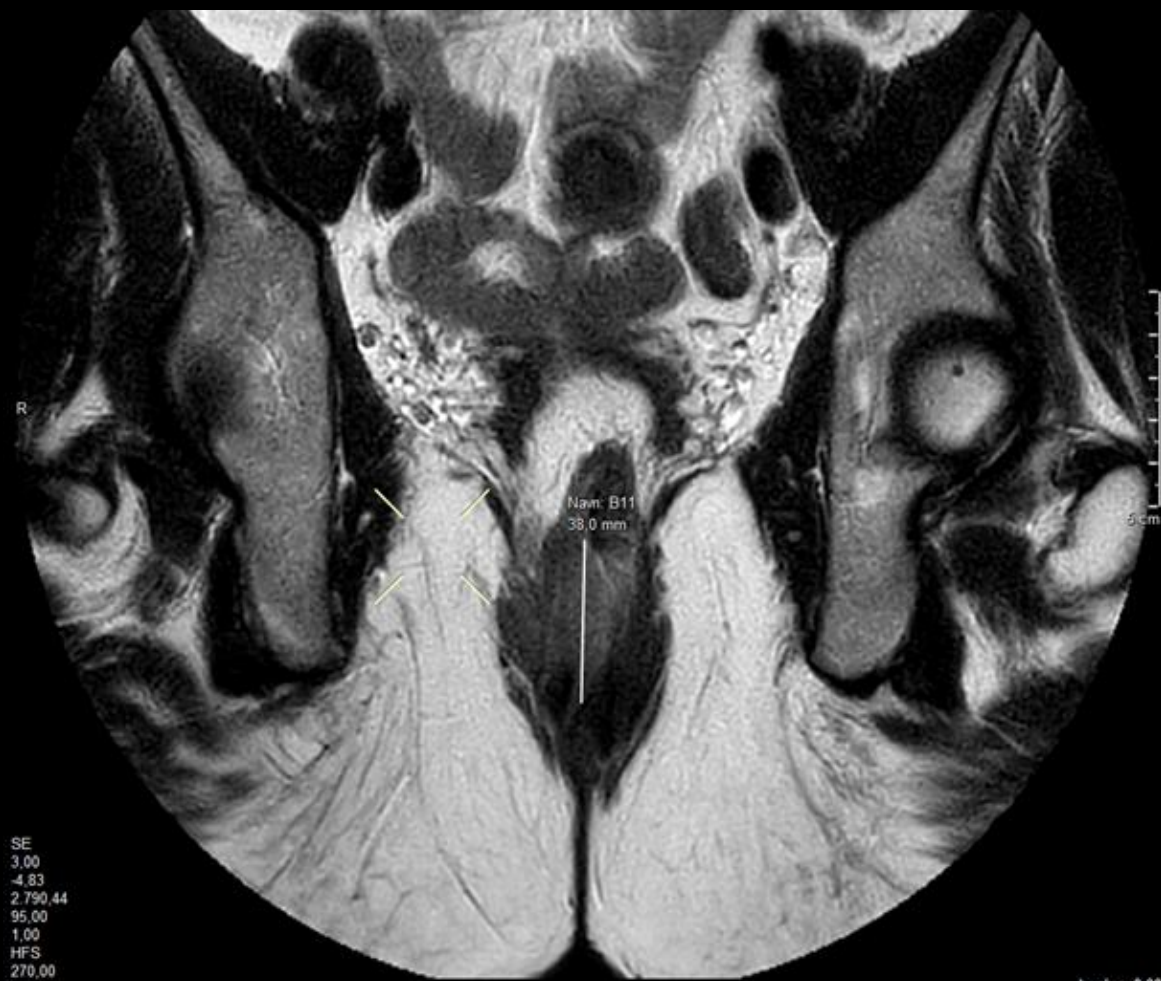
- Non-regional lymph node metastases
- Distant metastases
- Scanned from the base of the skull to the mid-femoral region on the PET scan
- Metser U, Lukovic J, Mesci A, MacCrostitie P, Chan R, Mak V, et al. [(18)F]-FDG PET/CT in the Initial Staging of Squamous Cell Cancer of the Anal Canal: Results of a Prospective Multicenter Registry. J Nucl Med. 2025;66(4):537-42.



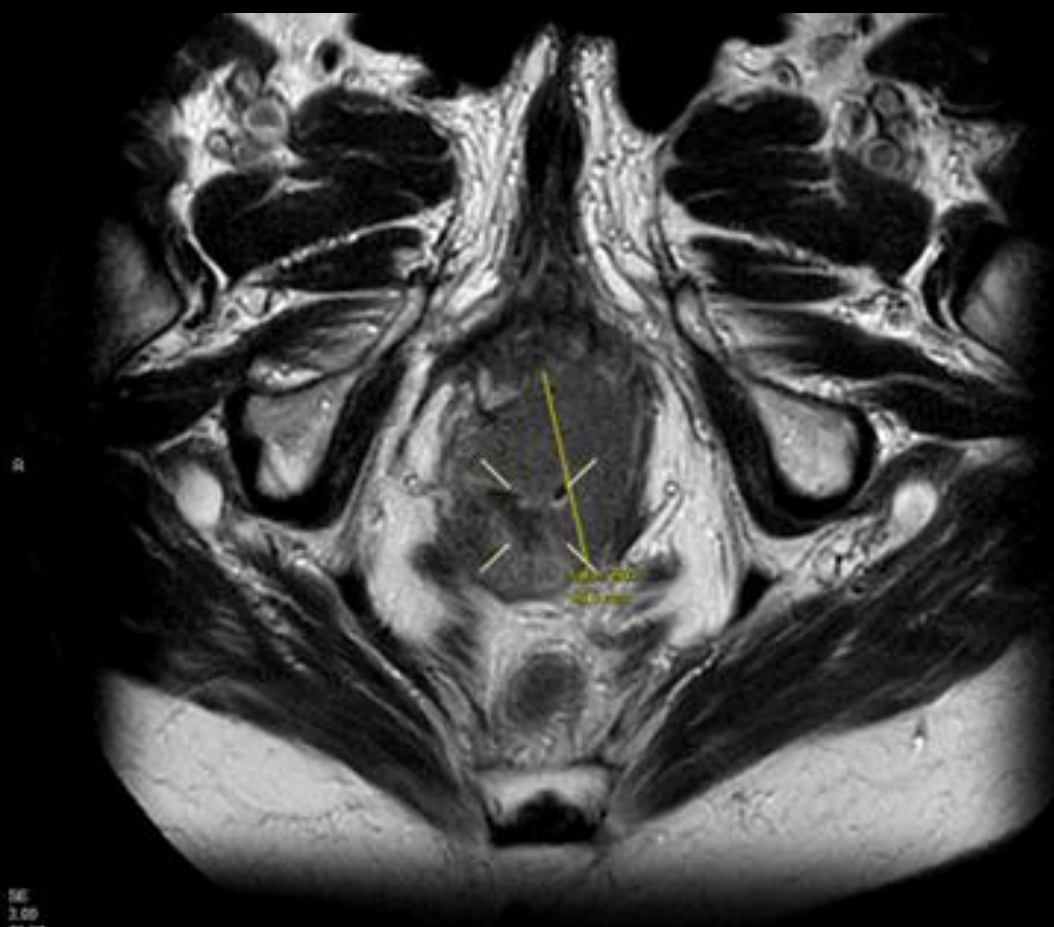


cCR









SE
3.00
76.37
3.467 A4
95.00
1.00
HF'S
270.00
0.00

PS

b-value: 0.00
C: 611
B: 1262

5 cm

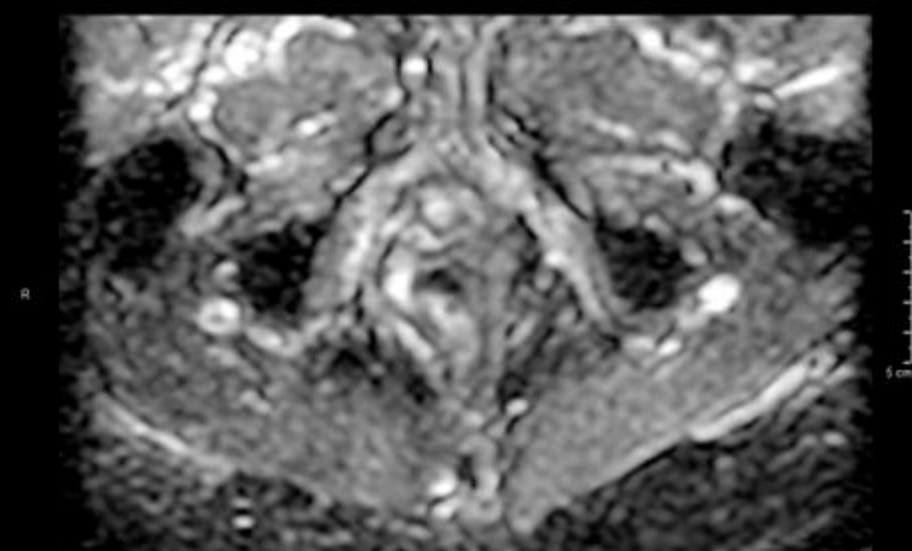
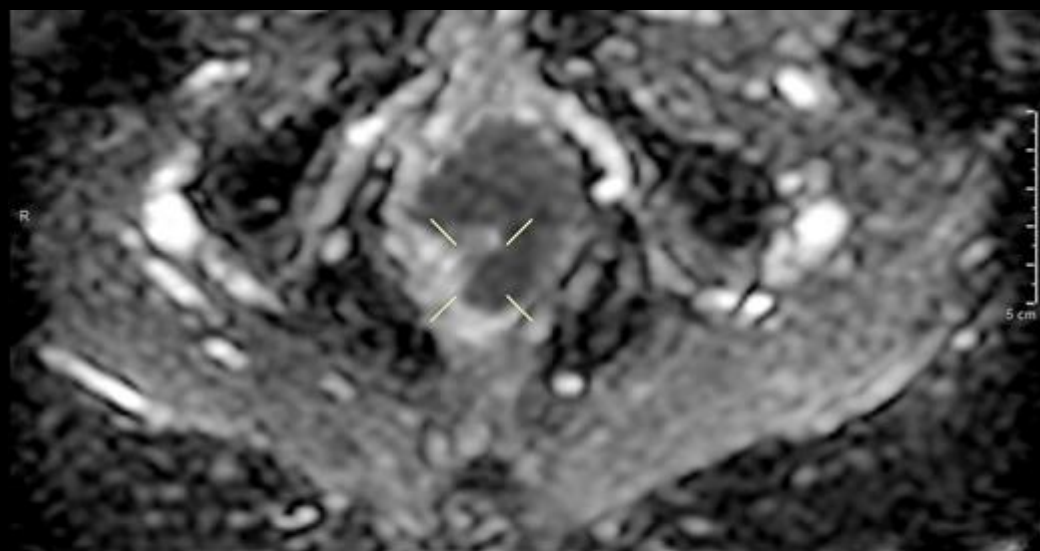
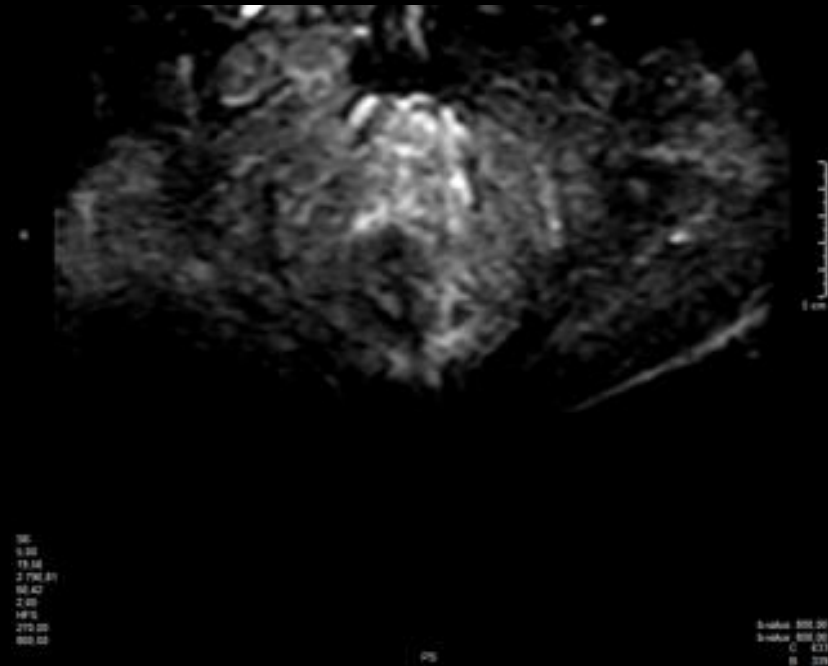
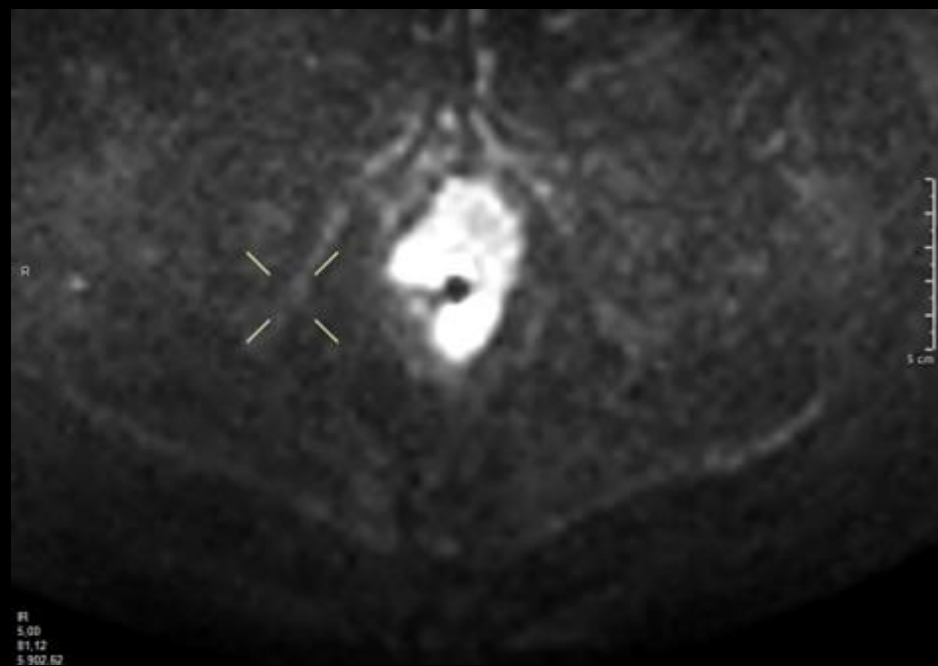


SE
3.00
25.10
3.366,41
90.00
1.00
HF'S
270.00
0.00

PS

b-value: 0.00
C: 729
B: 1253

5 cm



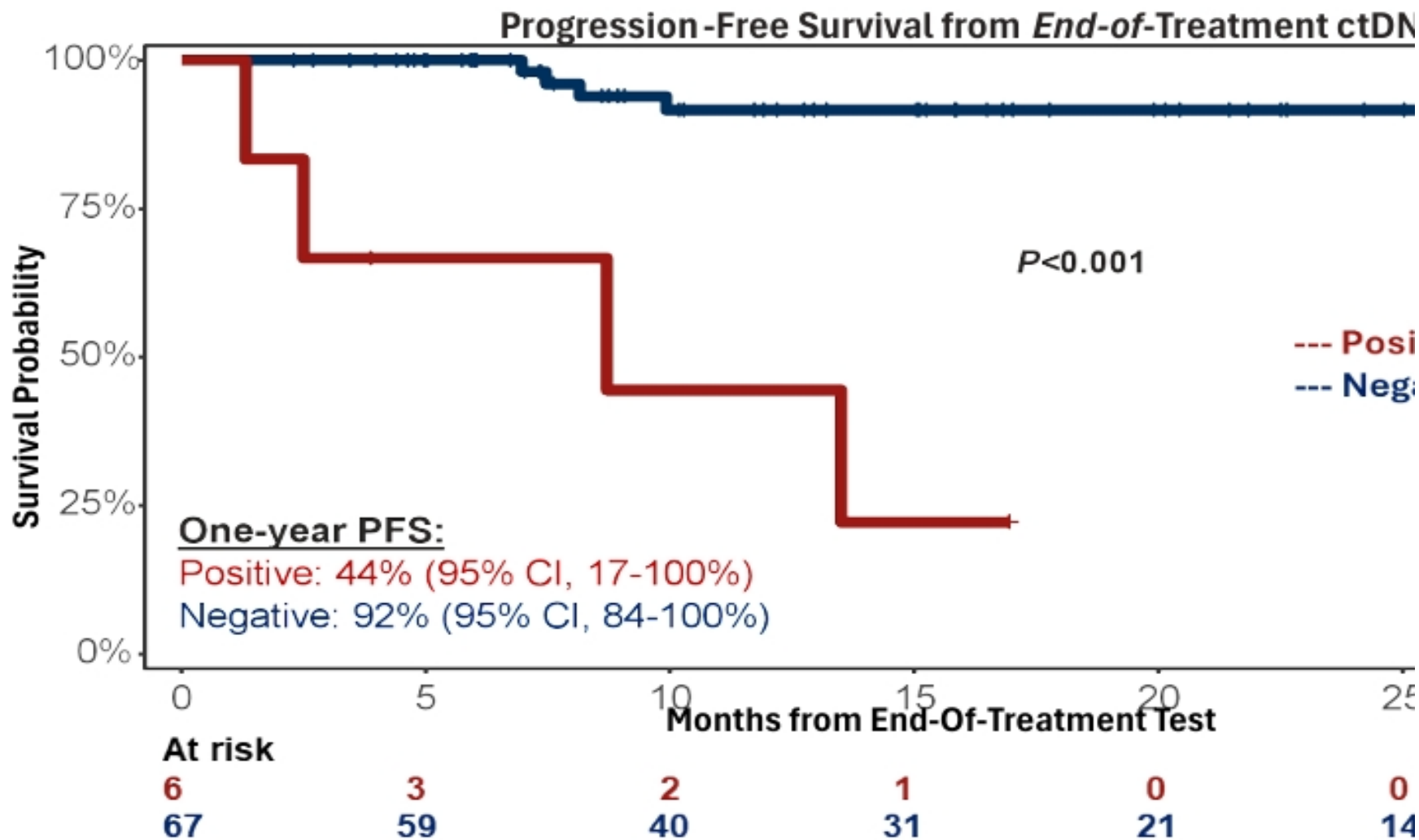
RM
 5.00
 81.12
 5.089.12
 60.42

RM
 5.00
 36.06

Follow-up after oncological treatment of anal cancer

- It may take up to **5-6 months** after completion of chemo-radiotherapy before the final treatment response can be assessed (A)
- Residual tumor/recurrence should be biopsy verified before salvage surgery (D)
- Patients with a **T1-T2/N0** tumor can be monitored solely with **clinical control** (D)
- Patients with a **T3/T4 or N+ or an HPV negative tumor** can be monitored with clinical follow-up as well as **MRI of the pelvis and FDG PET/CT after 6, 12, 24 and 36 months** (D)
- Patients should be offered follow-up after oncological treatment of localized anal cancer with a view to early diagnosis of recurrence and management and treatment of late effects of chemo-radiotherapy (D)
- Patients can be followed for up to 5 years after completion of oncological treatment (D)

Anal cancer: ct DNA



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Article in Press

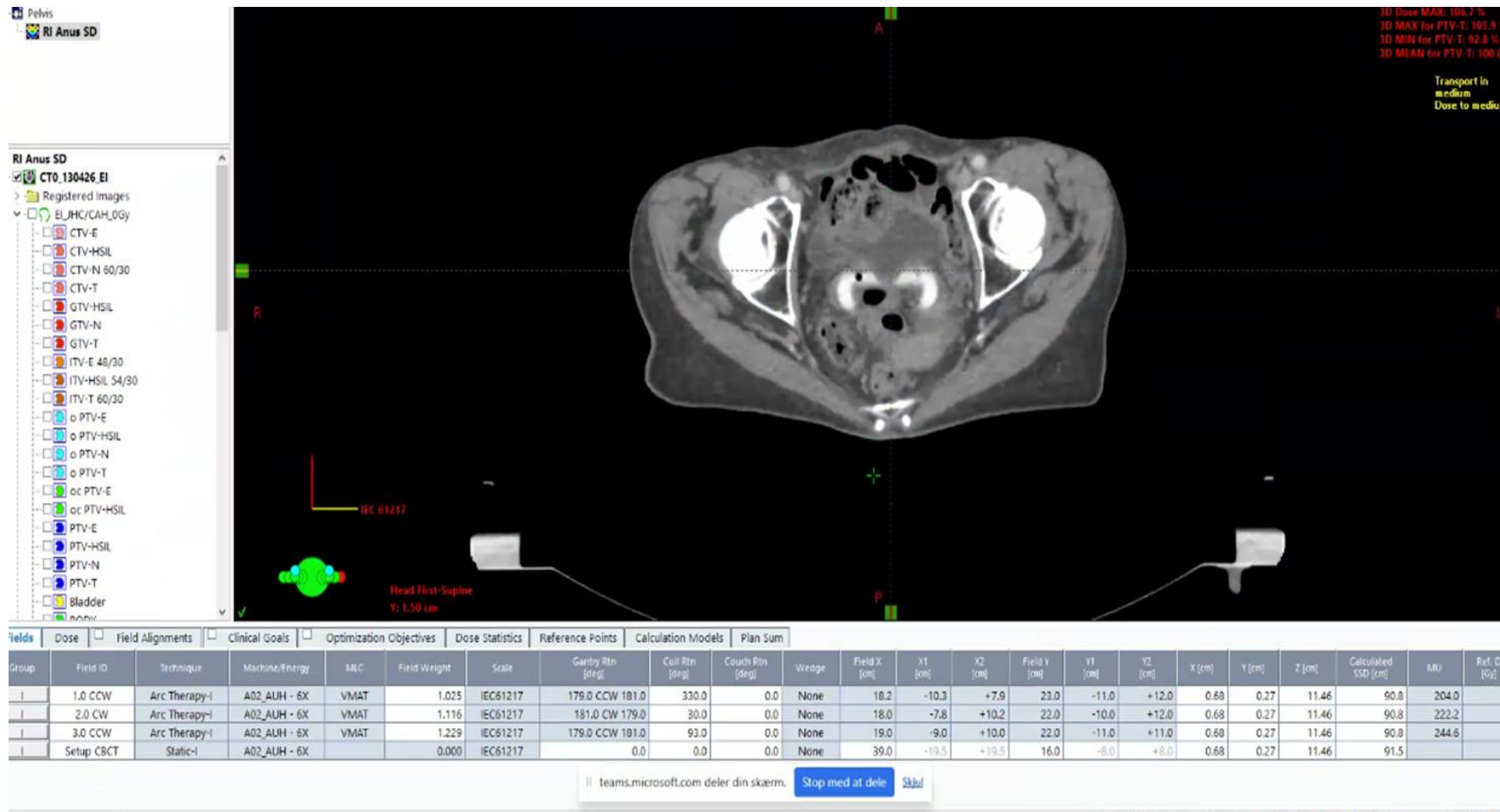
Tumor-informed circulating tumor DNA stratifies recurrence risk and survival in anal squamous cell carcinoma

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

doi:10.1017/S0022292412001609

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