**Supplemental Table 1.** Overview of baseline characteristics

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Authors, year | Country | Study design | Recruitment period | Definition of differentiation (highest grade or predominant) | Total patients, n | Males, n | Age (years) | Total number of LNM, n (%) | Rate of unfavorable differentiation, n (%) | Definition of differentiation | Treatment method |
| Bae, 2023 | Korea | Retrospective study | 2000-2015 | Predominant grade by JSCCR classification 2019 | 277 | 148 | 60 | 30 (10.8) | 4 (1.4) | Por | Primary and additional surgery |
| Ebbehøj, 2023 | Denmark | Retrospective study | 2016-2019 | Highest grade by WHO | 1167 | 639 | 68 | 170 (14.6) | 58 (5.0) | Por | Primary and additional surgery |
| Kajiwara, 2023 | Japan | Retrospective study | 2009-2016 | Predominant grade by JSCCR classification | 4673 | 2770 | 67 | 352 (8.1) | 59 (1.3) | Por, sig, muc | Primary and additional surgery, and endoscopy |
| Piao, 2023 | China | Retrospective study | 2015-2021 | Highest grade by WHO | 271 | 168 | 65 | 31 (11.4) | 10 (3.7) | Por | Primary and additional surgery, and endoscopy |
| Cho, 2022 | Korea | Retrospective study | 2010-2020 | Highest grade by WHO | 380 | 232 | 66 | 37 (9.7) | 7 (1.8) | Por, muc | Primary and additional surgery, and endoscopy |
| Ji, 2022 | China | Retrospective study | 2002-2020 | Highest grade by WHO | 183 | 112 | NA | 20 (10.9) | 23 (12.6) | Por | Primary surgery |
| Kim, 2022 | Korea | Retrospective study | 2002-2019 | Highest grade by WHO | 395 | 225 | 63 | 9 (2.3) | 52 (13.2) | Por, sig, muc, undifferentiated | Primary and additional surgery |
| Liu, 2022 | China | Retrospective study | 2010-2020 | Highest grade by WHO | 179 | 103 | 60 | 20 (11.1) | 6 (3.4) | Por, sig, muc, NEC | Primary and additional surgery |
| Morini, 2022 | Italy | Retrospective study | 2000-2018 | Highest grade by AJCC Cancer Staging Manual 8th edition | 122 | 65 | NA | 15 (12.3) | 20 (16.4) | Por | Primary and additional surgery |
| Ozeki, 2022 | Japan | Retrospective study | 2003-2019 | Predominant grade by JSCCR classification 2019 | 285 | 154 | 69 | 32 (11.2) | 3 (1.1) | Por, sig, muc | Primary and additional surgery |
| Ronnow, 2022 | Sweden/ Denmark | Prospective study | 2009-2017/ 2016-2018 | Highest grade by WHO | 1439 | 752 | 71 | 150 (10.4) | 145 (9.7) | Por | Primary and additional surgery |
| Song, 2022 | Korea | Retrospective study | 2010-2018 | Highest grade by WHO | 400 | 239 | 59 | 71 (17.8) | 16 (4.0) | Por | Additional surgery |
| Ahn, 2021 | USA | Retrospective study | 2004-2016 | Highest grade by AJCC Cancer Staging Manual 7th edition | 26733 | 14118 | NA | 2543 (9.5) | 2135 (8.0) | Por, undifferentiated | NA |
| Lee, 2020 | Korea | Retrospective study | 2008-2013 | Highest grade by AJCC Cancer Staging Manual | 906 | 532 | 60 | 178 (19.6) | 44 (4.9) | Por, sig, muc, undifferentiated | Primary and additional surgery |
| Mochizuki, 2020 | Japan | Retrospective study | 2001-2018 | Highest grade by WHO | 745 | NA | NA | 75 (10.1) | 149 (13.0) | Por, muc | Primary and additional surgery |
| Barel, 2019 | France | Retrospective study | 2009-2013 | Highest grade by WHO | 234 | 134 | 67 | 19 (8.1) | 13 (5.6) | Por, undifferentiated | Primary and additional surgery, and endoscopy |
| Makimoto, 2019 | Japan | Retrospective study | 2010-2018 | Predominant grade by JSCCR classification 2010 and 2016 | 53 | 24 | 68 | 8 (15.1) | 0 (0) | Por, sig, muc | Additional surgery |
| Yasue, 2019 | Japan | Retrospective study | 2005-2016 | Highest grade by WHO | 846 | 470 | 66 | 74 (8.7) | 93 (11.0) | Por, sig, muc | Primary and additional surgery, and endoscopy |
| Zhang, 2019 | China | Retrospective study | 2008-2014 | Highest grade by WHO | 290 | 151 | 60 | 45 (15.5) | 52 (17.9) | Por | Primary and additional surgery |
| Han, 2018 | Korea | Retrospective study | 2008-2012 | Highest grade by WHO | 492 | 296 | 61 | 55 (11.2) | 11 (2.2) | Por, muc | Primary and additional surgery |
| Belderbos, 2017 | Netherlands | Retrospective study | 1995-2011 | Highest grade by AJCC Cancer Staging Manual 7th edition | 650 | NA | NA | 72 (11.1) | 50 (7.7) | Por, undifferentiated | Primary and additional surgery |
| Chen, 2017 | China | Retrospective study | 2007-2013 | Highest grade by WHO | 51 | 31 | 63 | 5 (9.8) | 2 (3.9) | Por | Additional surgery |
| Ha, 2017 | Korea | Retrospective study | 2001-2015 | Highest grade by WHO | 745 | 471 | 61 | 91 (12.2) | 19 (2.6) | Por | Primary and additional surgery |
| Pai, 2017 | USA | Retrospective study | 2010-2014 | Highest grade by WHO | 116 | 62 | 63 | 28 (24.1) | 10 (8.6) | Por | Primary and additional surgery |
| Machado, 2016 | Spain | Retrospective study | 2006-2014 | Predominant grade by the College of American Pathologist protocol classification | 100 | NA | NA | 19 (19.0) | 6 (6.0) | Por, sig, muc | Primary and additional surgery |
| Kim, 2016 | Korea | Retrospective study | 2005-2012 | Predominant grade by JSCCR classification 2010 | 344 | NA | NA | 19 (5.5) | 6 (1.7) | Por | Primary and additional surgery |
| Macias-Garcia, 2015 | Spain | Retrospective study | 2000-2011 | Highest grade by WHO | 97 | 61 | 68 | 14 (14.4) | 6 (6.2) | Por | Primary and additional surgery |
| Caputo, 2014 | Italy | Retrospective study | 2001-2013 | Highest grade by WHO | 48 | 23 | 71 | 6 (12.5) | 10 (20.8) | Por | Primary and additional surgery |
| Nishida, 2014 | Japan | Retrospective study | 2000-2011 | Predominant grade | 265 | 161 | 65 | 31 (11.7) | 7 (2.6) | Por | Primary surgery |
| Yoshii, 2014 | Japan | Retrospective study | 1989-2008 | Highest grade by WHO | 205 | NA | NA | 14 (6.8) | 23 (11.2) | Por, sig, muc | Additional surgery and endoscopy |
| Suh, 2013 | Korea | Prospective study | 2007-2012 | Highest grade by WHO | 75 | NA | NA | 10 (13.3) | 7 (9.3) | Por | Additional surgery |
| Wada, 2013 | Japan | Retrospective study | 1995-2005 | Predominant grade | 120 | 82 | 64 | 12 (10.0) | 6 (5.0) | Por | Primary and additional surgery |
| Kobayashi, 2011 | Japan | Retrospective study | 1991-1996 | Predominant grade by JSCCR classification | 798 | 379 | 60 | 83 (10.4) | 11 (1.4) | Por, muc | Primary and additional surgery |
| Ishii, 2010 | Japan | Retrospective study | 25 years | Predominant grade | 203 | NA | NA | 16 (7.9) | 13 (6.4) | Por | Primary and additional surgery |
| Choi, 2008 | Korea | Retrospective study | 1989-2004 | Highest grade by WHO | 168 | 99 | 57 | 24 (14.3) | 4 (2.4) | Por | Primary and additional surgery |
| Kazama, 2006 | Japan | Retrospective study | 1990-2001 | Predominant grade by JSCCR classification | 56 | 41 | 63 | 16 (28.6) | 1 (1.8) | Por | Primary surgery |
| Wang, 2005 | Taiwan | Retrospective study | 1969-2002 | Predominant grade | 159 | 107 | 65 | 16 (10.1) | 7 (4.4) | Por | Primary and additional surgery, and endoscopy |
| Watanabe, 2005 | Japan | Retrospective study | 1997-2003 | Predominant grade | 59 | 36 | 65 | 9 (15.3) | 0 (0) | NA | Primary surgery |
| Yamamoto, 2004 | Japan | Retrospective study | 1970-2001 | Predominant grade by JSCCR classification | 301 | 218 | 62 | 19 (6.3) | 4 (1.3) | Por | Primary and additional surgery, and endoscopy |
| Sakuragi, 2003 | Japan | Retrospective study | 1979-2000 | Predominant grade by JSCCR classification | 271 | 175 | 62 | 21 (7.7) | 7 (2.6) | Por, sig, muc | Primary and additional surgery, and endoscopy |
| Tsuruta, 2000 | Japan | Retrospective study | 1995-1999 | Highest grade by WHO | 77 | 56 | 63 | 13 (16.9) | 8 (10.4) | Por, sig, muc | Primary and additional surgery |
| Coverlizza, 1989 | Italy | Retrospective study | 1975-1987 | Highest grade by WHO | 14 | 7 | 57 | 5 (35.7) | 4 (28.6) | Por | Additional surgery |

\*Only cases with radical surgery or completion surgery were included. If endoscopic resection was performed without completion surgery and there was no specific statement on LNM-status, cases were excluded.

Abbreviations used in this paper: AJCC, American Joint Committee on Cancer; CI confidence interval; JCCRS, Japanese Society for Cancer of the Colon and Rectum; LNM, lymph node metastasis; NA, not applicable; NEC, neuroendocrine carcinoma; WHO, World Health Organization.

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