

Stereotactic radiotherapy for the treatment of nasopharyngeal carcinoma: a Meta-analysis of 1371 cases in China

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Abstract

Objective The aim of this study was to clarify the outcomes of stereotactic radiotherapy for the treatment of local residual and (or) local recurrent nasopharyngeal carcinoma and to promote scientific clinical treatment and research on it in China and other countries by creating a large data resource.

Methods This Meta-analysis conducted a literature search using the China National Knowledge Infrastructure database for all clinical research articles on stereotactic radiotherapy for the treatment of local residual and (or) local recurrent nasopharyngeal carcinoma in China. Data on patient cohort numbers and other research factors were recorded for every relevant clinical research article. Calculated and analyzed these fact sheets to pave the way for the objective of this project.

Results A total of 40 clinical research articles including 1,371 patients in China from 1998 to 2012 were identified. The average cohort size was 34 patients (range 9–98 patients). The average total radiation dose range was 16–33.6 Gy. The average study or treatment duration was 3.51 years. The calculated average follow-up time was 31.59 months.

Conclusion The study provided the largest resource for further research and Meta-analyses to determine the clinical pathway of stereotactic radiotherapy for the treatment of local residual and (or) local recurrent nasopharyngeal carcinoma. The results indicated that variability in the total radiation dose, treatment or research time, and follow-up duration may have contributed to the complications and side effects of stereotactic radiotherapy for local residual and (or) local recurrent nasopharyngeal carcinoma in China. The calculated average total radiation dose, follow-up time, and treatment and research durations may be referenced for future treatment and research. This study also proposed worldwide cooperation for the meta-analysis of research articles on stereotactic radiotherapy for treating local residual and (or) local recurrent nasopharyngeal carcinoma.

Key words: stereotactic radiotherapy; residual nasopharyngeal carcinoma; recurrent nasopharyngeal carcinoma; Meta-analysis; total radiation dose; radiotherapy

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There is a dose-response relationship between tumor control and radiation [1–3]. The local residual and local recurrence rates of nasopharyngeal carcinoma (NPC) are 10% and 30%, respectively [4]. The local recurrence of NPC after radiotherapy (RT) remains a major cause of treatment failure.

The locoregional control rate of NPC has improved significantly in the past decade due to advances in imaging, RT technique, and the use of combined treatment modalities. The reported 5-year local control rates of NPC in modern series ranged from 81% to 85%, with

control rates exceeding 90% in patients with T1 disease [5–6]. Despite the improved outcomes in local control, local recurrence still represents a major cause of mortality and morbidity in advanced stages and management of local failure remains an important and challenging issue in NPC treatment.

Aggressive salvage treatment is generally recommended for local recurrence since long-term control can still be achieved in some patients.

Since Konziolka *et al.* reported the use of stereotactic radiosurgery (SRS) to treat one case of recurrent NPC

in 1991, radiation oncologists have applied stereotactic radiotherapy (SRT) for extracranial tumors, such as those in the head, neck, and body [7]. Multiple medical institutions reported the use of SRS or fractionated stereotactic radiotherapy (FSRT) as a boost for residual NPC after initial RT. Since 1991, retrospective studies have analyzed the efficacy and complications of SRS or FSRT in residual NPC disease.

Retrospective studies have also considered SRT as a boost treatment for residual or recurrent NPC, reporting improved local control and decreased complications [3, 8]. However, the mortality due to nasopharyngeal massive hemorrhage in residual or recurrent NPC after FSRT ranged from 16.0% to 22.2% [9–17].

Other complications of SRS or FSRT can also occur. For example, necrosis of the nasopharyngeal mucous membrane, infection, cranial nerve injuries, cranial neuropathies, temporal lobe necrosis, *et al.* have been reported [15, 17–19].

China, especially the southern region, has higher morbidity due to nasopharyngeal carcinoma. SRT has been widely used clinically since 1991 when its benefits as a boost treatment were reported in residual or recurrent NPC.

Retrospective and cohort studies have assessed the efficacy and complications of SRT in the clinical setting, the results of which may allow radiation oncologists to more effectively treat patients with nasopharyngeal carcinoma. However, Chinese studies and their reporting are inconsistent in radiation dose, dose fraction plans for SRT, and other management of SRT in clinical applications.

The complications of SRT are key factors in determining if the treatment is warranted and remain a significant challenge for radiation oncologists. It is imperative to determine how to reduce SRT complications and create a better clinical pathway for SRT. Therefore, the present study searched for clinical research articles on SRT for the treatment of residual and (or) recurrent nasopharyngeal carcinoma in China between 1998 and 2012 indexed in the China National Knowledge Infrastructure (CNKI) network, with special attention to the patient cohort numbers, radiation dose, and other factors. The research objectives were to enhance the quality of SRT and to pave the way for the creation of a clinical pathway for the application of SRT.

Until now, there has been no report on this kind of analysis; namely, the identification of articles through a search of the titles and keywords of English-language literature from the MEDLINE database instead performed through a CNKI search of the Chinese and English titles of papers and keywords in Chinese-language literature.

Materials and methods

Literature search

The present study searched the CNKI for all relevant clinical research articles on SRT for the treatment of nasopharyngeal carcinoma in China.

The CNKI is the largest digital library in the world in Knowledge Resource. It is operated by Tsinghua University and supported by the Chinese government. It was initiated by World Bank in 1998 [20]. The CNKI contains a China Knowledge Resource Integrated Database for all professions, including medical science and its radiation oncology branch. The CNKI includes a database of qualified medical journals, including all journals on radiation oncology. The CNKI can be reached via the Internet, providing a convenient way to search for clinical research articles on SRT for the treatment of residual and (or) recurrent nasopharyngeal carcinoma in China.

The CNKI was searched for clinical research articles of SRT for residual and (or) recurrent nasopharyngeal carcinoma in China via the Internet on a personal computer. The identified articles were then checked. Information for some articles was obtained by paying the CNKI. The author was only the individual performing the literature search.

The CNKI provides directions for performing searches. However, due to the network limitations, not all information could be obtained and calculated from the 40 identified articles. Moreover, only the latest clinical research article on SRT published in 2012 was available directly from the Chinese Medical Journal at the research time [21].

Inclusion criteria

Data from the identified clinical research articles on SRT for residual and (or) recurrent nasopharyngeal carcinoma in China were recorded in the common reference format for articles included in qualified journals. The patient numbers, total radiation doses, average follow-up times, average research treatment time, and other information were recorded. These data were used to calculate fact sheets describing the clinical studies to achieve the study objective.

Statistical analysis

The statistical method was straightforward: the related facts of the published articles were obtained and the total numbers, averages, etc. were calculated.

Data extraction and quality assessment

Because all data were numbers and article characteristics, their total or average numbers were calculated. Therefore, data extraction and quality assessment were straightforward. Data extraction and quality assessment were performed by re-confirming the findings.

Results

The article first authors, journals, journal grade, patient numbers, publication year, total radiation doses, treatment or study period duration, and follow-up information were listed in Table 1.

A total of 40 clinical research articles on SRT for the

Table 1 Authors, journal, journal grade, patient cohort size, publication year, study period, and follow-up information of the included studies

No.	Author	Published year	Journal	Grade of Journal	Patient numbers	Total radiation dose	Treatment year	Hospital grade	Time of follow-up
1	Deng XQ, <i>et al.</i>	1998	J Harbin Med Univ	N	9	1998	1996.12–1998.2		3 months
2	Cao YZ, <i>et al.</i>	2000	Chin J Clin Oncol	N&K	10	2000	1997	Province	
3	Xiao JP, <i>et al.</i>	2000	Chin J Radiat Oncol	N&K	50	24–30Gy	1995.9.20–1998.12.30	National	
4	Cui SX, <i>et al.</i>	2001	Chin J Radiat Oncol	N&K	18	24–40Gy; 24–30Gy; 40–42Gy (divided three groups)		National	
5	Feng J, <i>et al.</i>	2001	Guizhou Med J	P	50	(600–800cGy)x3		Province	
6	Xiao H, <i>et al.</i>	2001	Cancer Res Prev Treat	P	16	12–25Gy		National	6–12 months
7	Xiao JP, <i>et al.</i>	2001	Int J Radiat Oncol Biol Phys	International	50	14–35Gy	1995.9.20–1998.12.30	National	year 1, 2, 3
8	Wu SX, <i>et al.</i>	2002	Chin J Cancer	N&K	12		1998.9–2000.9	National	
9	Xu WD, <i>et al.</i>	2002	Jiangsu Med J	P&K	44	20–49Gy		National	
10	Zhao SX, <i>et al.</i>	2002	Chin J Clin Oncol	N&K	16		1996.10–2001.1	National	
11	Chen HJ	2003	Acta Med Sin	P	18	8–24Gy		Province	
12	Zhong J, <i>et al.</i>	2003	Pract J Cancer	P	33	12–48Gy	1997.7–2001.7	Province	
13	Zhao SX, <i>et al.</i>	2003	Chin J Radiol Med Prot	N&K	16		1996.10–2001.1	National	
14	Guo YX	2003	Shaanxi Med J	P&K	13	(6–8Gy)x3		Province	
15	Jiang W, <i>et al.</i>	2003	Tianjing Med J	P&K	27	(5–8Gy)x(5–8)times	1997.6–2002.2	Province	
16	Ning XJ, <i>et al.</i>	2003	Cancer Res Clin	N	32		2000.9–2002.5	City	
17	Liu HP, <i>et al.</i>	2003	J Third Mil Med Univ	N&K	24		1995–1998	National	
18	WU SX, <i>et al.</i>	2004	Chin J Radia Oncol	N&K	30	Residual: 18Gy; Recurrence: 48Gy	1999.9–2002.6.30	National	15 months
19	Cheng GJ, <i>et al.</i>	2004	Chin J Cancer Prev Treat	P	22	30–40Gy	Case control study with conventional RT 20 patients	City	3–6 months
20	Shi QF, <i>et al.</i>	2004	Shenyang Mil Med	P	38	12–48Gy (Median dose 34 Gy)	1999.4–2001.4	Province	
21	Huang BJ, <i>et al.</i>	2004	Cancer Res Clin	N	27		1998.5–2002.12 After Con-ventional RT, SRT	City	

No.	Author	Published Year	Journal	Grade of Journal	Patient numbers	Total radiation dose	Treatment year	Hospital grade	Time of follow-up
22	Song YH, <i>et al.</i>	2004	Chin Clin Oncol	N	16		1997.7–2000.12	Province	
23	Pang XL, <i>et al.</i>	2004	J Third Mil Med Univ	N&K	32	Median dose 12Gy (8–20Gy)	1998.1–2001.12	National	Year 1, 2, 3
24	Ao F, <i>et al.</i>	2004	Pract J Cancer	P	23	24–64Gy, Median dose 52.2Gy		Province	Year 1, 2.
25	Lang JY, <i>et al.</i>	2004	Sichuan Med J	P	20 (14 cases FSRT+ other RT; 6 cases FSRT.			Province	3 years
26	Xiao JP, <i>et al.</i>	2005	Chin J Radiat Oncol	N&K	98	12–24Gy		National	1–8 years
27	Chen S, <i>et al.</i>	2005	J Guangxi Med Univ	P&K	34		2001.11–2003.11	Province	
28	Guo YX, <i>et al.</i>	2006	J Zhengzhou Univ (Med Sci)	P&K	13		1999.1–2001.12	Province	
29	Li YM, <i>et al.</i>	2006	Cancer Res Clin	N	54 (two groups)	83.23Gy and 99.09Gy (two groups)	1996–2000	City	Year 1, 3, 5
30	Wu SX, <i>et al.</i>	2007	Int J Radiat Oncol Biol Phys	International	90, with 34 per-sistent; 56 recurrence	Median FSRT dose was 18 Gy in three fractions (Group 1) or 48 Gy in six fractions (Group 2).	1999.9–2005.12	National	Median follow-up was 20.3 months
31	Wang RZ, <i>et al.</i>	2007	Cancer Res Prev Treat	N&K	31	Median dose 16Gy (12–20Gy)	2004.2–2006.10	Province	Year 1, 2, 3
32	Wu SX, <i>et al.</i>	2007	Chin J Radiat Oncol	N&K	90	Median FSRT dose was 18 Gy in three fractions (persistent Group 1) or 48 Gy in six fractions (recurrence Group 2)	1999.9–2005.12	National	Median follow-up was 24.9 months (3.3–86.3)
33	Wu SX, <i>et al.</i>	2007	J Oncol	P	90, with 34 persis-tent; 56 recurr-ence	Median FSRT dose was 18 Gy in three fractions (persistent Group 1) or 48 Gy in six fractions (recurrence Group 2)	1999.9–2005.12	National	Median follow-up was 24.9 months (3.3–86.3)
34	Zhang SG, <i>et al.</i>	2008	J Chin Med Abstr (Oncology)	N	36			City	
35	Lin GJ	2008	J Mod Oncol	N	24	8Gy–24Gy	2001.8–2003.11	Province	
36	WANG RZ, <i>et al.</i>	2008	China Oncol	N&K	41	12–28Gy (Median dose: 16Gy)	2004.2–2007.4	Province	Median follow-up was 28 months (3–41 months)
37	Zhou ZJ, <i>et al.</i>	2009	J Basic Clin Oncol	P	20	25Gy		Province	Year 1, 2, 3
38	Cao Yi	2010	Mod Med Health	P	32	12Gy (Median dose)		City	Year 1, 2, 3
39	Li L, <i>et al.</i>	2010	J Mil Surg in Southwestern China	P	36	12–20Gy		Province	Year 1, 2, 3
40	Liu F, <i>et al.</i>	2012	Chin Med J	N&K	36	10.0–24.0 Gy (median, 16.5 Gy)	2006.8–2010.8	National	Median follow-up time was 34 months (range, 12–59 months)

K. National key medical Journal; N. National grade Journal; P. Province grade Journal.

treatment of residual and (or) recurrent nasopharyngeal carcinoma in China were identified. The earliest and most recent published articles were from 1998 and 2012, respectively. The 40 studies included a total of 1,371 patients. The average cohort size was 34 patients, ranging from 9 to 98 patients.

Among the journals in which these research articles were published 19 were national key medical journals. Seventeen were provincial-grade medical journals and 21 were national-grade medical journals.

Among the research hospitals or institutes in which the clinical studies were performed, 16 were national-grade, 17 were provincial-grade, and 6 were city-grade hospitals. Generally, the quality of national-grade hospitals is higher than that of provincial-grade hospitals and the quality of provincial-grade hospitals is higher than that of city-grade hospitals.

Among the 40 research articles, 27 studies indicated or provided data to calculate the total radiation dose. Twenty studies provided data to calculate the average radiation dose (16–33.6 Gy). The average radiation dose could not be calculated in seven articles because their units of measurement were not consistent. The highest total radiation dose was 99.09 Gy.

The average SRT treatment or study duration among 26 studies was 3.51 years, ranging from 1.25 to 6.33 years. The earliest reported start time for SRT and study was September 20, 1995.

The follow-up durations of the 19 studies for which this information was available ranged from 3 months to 8 years. The average follow-up time for 19 studies was 31.59 months.

The first author, article title, journal, publication year, volume, and page are listed in Table 2.

Table 2 The author of article, article title, published Journal, published year, volume and page

No.	Author	Article title	Journal published, and published year	Volume and number and page
1	Deng XQ, <i>et al.</i>	Treatment of residual or recurrent nasopharyngeal carcinoma by X-knife with 9 patients	J Harbin Med Univ (Chinese), 1998	48 (3): 63–64
2	Cao YZ, <i>et al.</i>	Stereotatic radiotherapy on 10 patients with nasopharyngeal carcinoma	Chin J Clin Oncol (Chinese), 2000	38 (3): 72–73
3	Xiao JP, <i>et al.</i>	Fractionated stereotatic radiotherapy for 50 patients with recurrent and residual nasopharyngeal carcinoma	Chin J Radia Oncol (Chinese), 2000	14 (4): 40–44
4	CUI SX, <i>et al.</i>	Nasopharyngeal hemorrhage after radiotherapy of nasopharyngeal carcinoma	Chin J Radiat Oncol (Chinese), 2001	15 (3): 39–41
5	Jin Fe, <i>et al.</i>	Fractionated stereotatic radiotherapy on 50 patients with residual or recurrent nasopharyngeal carcinoma	Guizhou Med J (Chinese), 2001	26 (2): 119–120
6	Xiao H, <i>et al.</i>	Preliminary clinical study of the effect of stereotactic radiotherapy boost following conventional radiotherapy on local control rate of primary nasopharyngeal carcinoma	Cancer Res Prev Treat (Chinese), 2001	29 (5): 405–406
7	Xiao JP, <i>et al.</i>	Fractionated stereotatic radiotherapy for 50 patients with recurrent and residual nasopharyngeal carcinoma	Int J Radiat Oncol Biol Phys, 2001	51: 164–170
8	Wu SX, <i>et al.</i>	Fractionated stereotactic radiotherapy for locally recurrent nasopharyngeal carcinoma, the primary result	Chin J Cancer (Chinese), 2002	21 (7): 804–805
9	Xu WD, <i>et al.</i>	Stereotactic radiotherapy for locally residual and recurrent nasopharyngeal carcinoma	Jiangsu Med J (Chinese), 2002	28 (6): 441–441+397
10	Zhao SX, <i>et al.</i>	Stereotactic radiotherapy for locally residual and recurrent nasopharyngeal carcinoma	Chin J Clin Oncol (Chinese), 2002	40: 64–65
11	Chen HJ	Fractionated stereotatic radiotherapy on 24 patients with nasopharyngeal carcinoma	Acta Med Sin (Chinese), 2003	16: 823–824
12	Zhong J, <i>et al.</i>	Stereotactic radiotherapy for residual or recurrent nasopharyngeal carcinoma	Pract J Cancer (Chinese), 2003	18: 74–76
13	Zhao SX, <i>et al.</i>	Nasopharyngeal hemorrhage after stereotactic radiotherapy for locally residual and recurrent nasopharyngeal carcinoma	Chin J Radiol Med Prot (Chinese), 2003	23 (4): 52–53
14	Guo YX	Fractionated stereotactic radiotherapy for patients with residual or recurrent nasopharyngeal carcinoma	Shaanxi Med J (Chinese), 2003	41: 993–994
15	Jiang W, <i>et al.</i>	Stereotactic radiotherapy with 27 patients following conventional radiotherapy in nasopharyngeal carcinoma	Tianjing Med J (Chinese), 2003	45 (11): 710–712
16	Ning XJ, <i>et al.</i>	Fractionated stereotatic radiotherapy with 32 patients of nasopharyngeal carcinoma after primary conventional radiotherapy	Cancer Res Clin (Chinese), 2003	18: 262–263

No.	Author	Article title	Journal published, and published year	Volume and number and page
17	Liu HP, <i>et al.</i>	Treatment of nasopharyngeal carcinoma by X-knife	J Third Mil Med Univ (Chinese), 2003	25 (20): 1871–1872
18	WU SX, <i>et al.</i>	Fractionated stereotactic radiotherapy for locally residual or recurrent nasopharyngeal carcinoma	Chin J Radiat Oncol (Chinese), 2004	23 (1): 10–13
19	Cheng GJ, <i>et al.</i>	Late course stereotactic radiotherapy locally recurred nasopharyngeal carcinoma after radiotherapy: Including clinical analysis of 42 cases	Chin J Cancer Prev Treat (Chinese), 2004	11 (5): 527–528
20	Shi QF, <i>et al.</i>	Stereotactic radiotherapy for residual or recurrent nasopharyngeal carcinoma after radiotherapy	Shenyang Mil Med, 2004	17 (2): 103–105
21	Huang BJ, <i>et al.</i>	Fractionated stereotatic radiotherapy on 27 patients with residual nasopharyngeal carcinoma	Cancer Res Clin (Chinese), 2004	19 (1): 38–39
22	Song YH, <i>et al.</i>	Stereotatic radiotherapy on 16 patients with residual or recurrent nasopharyngeal carcinoma	Chin Clinl Oncol (Chinese), 2004	10 (2): 180–181
23	PANG XL, <i>et al.</i>	Clinical study of stereotactic radiotherapy boost on improvement of local control and survival of nasopharyngeal carcinoma	J Third Mil Med Univ (Chinese), 2004	26 (24): 2203–2205
24	Ao F, <i>et al.</i>	Fractionated 3-Dimensional Stereotactic Radiotherapy for Locally Recurrent Nasopharyngeal Carcinoma	Pract J Cancer (Chinese), 2004	20 (5): 530–532
25	Lang JY, <i>et al.</i>	Prospective research on the efficacy of residual or recurrent nasopharyngeal carcinoma treated with fractionated stereotactic radiotherapy (SRT)	Sichuan Med J (Chinese), 2004	25: 951–955
26	Xiao JP, <i>et al.</i>	Fractionated radiosurgery for residual lesion after the first course of radiotherapy for nasopharyngeal carcinoma	Chin J Radiat Oncol (Chinese), 2005	19 (2): 8–11
27	Chen S, <i>et al.</i>	Clinical study on fractionated stereotatic radiotherapy for 34 patients with nasopharyngeal carcinoma	J Guangxi Med Univ (Chinese), 2005	35 (2): 308
28	Guo YX, <i>et al.</i>	Stereotactic radiotherapy with 13 patients for locally residual or recurrent nasopharyngeal carcinoma	J Zhengzhou Univ (Med Sci) (Chinese), 2006	50: 1196–1197
29	Li YM, <i>et al.</i>	Evaluation of late course fractionated stereotactic radiotherapy for nasopharyngeal carcinoma	Cancer Res Clin (Chinese), 2006	21 (10): 672–673
30	Wu SX, <i>et al.</i>	Outcome of fractionated stereotactic radiotherapy for 90 patients with locally persistent and recurrent nasopharyngeal carcinoma	Int J Radiat Oncol Biol Phys, 2007	69: 761–769
31	Wang RZ, <i>et al.</i>	Fractionated stereotatic radiotherapy boost on 31 patients with residual nasopharyngeal carcinoma	Cancer Res Prev Treat (Chinese), 2007	35 (10): 773–776
32	Wu SX, <i>et al.</i>	Prognostic factors of locally persistent and recurrent nasopharyngeal carcinoma treated with stereotactic radiotherapy	Chin J Radiat Oncol (Chinese), 2007	21 (6): 407–410
33	Wu SX, <i>et al.</i>	Preliminary study of target volume delineation for locally persistent and recurrent nasopharyngeal carcinoma treated with fractionated stereotactic radiotherapy	J Oncol (Chinese), 2007	31 (5): 355–358
34	Zhang SG, <i>et al.</i>	Fractionated stereotactic radiotherapy for locally residual or recurrent nasopharyngeal carcinoma	J Chin Med Abstr (Oncology) (Chinese), 2008	27 (4): 351
35	Lin GJ	Fractionated stereotactic radiotherapy for locally residual or recurrent nasopharyngeal carcinoma	J Mod Oncol (Chinese), 2008	16 (6): 940–941
36	Wang RZ, <i>et al.</i>	Fractionated stereotactic radiotherapy for locally residual or recurrent nasopharyngeal carcinoma	China Oncol (Chinese), 2008	18 (2): 128–134
37	Zhou Zj, <i>et al.</i>	Treatment of 20 patients with locally Residual nasopharyngeal carcinoma by X-knife	J Basic Clin Oncol (Chinese), 2009	19 (2): 170–171
38	Cao Y	Stereotactic radiotherapy for nasopharyngeal carcinoma after first primary radiotherapy	Mod Med Health (Chinese), 2010	26 (1): 98–99
39	Li L, <i>et al.</i>	Stereotactic radiotherapy for nasopharyngeal carcinoma after first primary radiotherapy	J Mil Surg Southwestern China (Chinese), 2010	20 (4): 678–679
40	Liu F, <i>et al.</i>	Fractionated stereotactic radiotherapy with vagina carotica protection technique for local residual nasopharyngeal carcinoma after primary radiotherapy	Chin Med J, 2012	125 (14): 2525–2529

Discussion and conclusion

SRT is effective for local residual and (or) local recurrent NPC. However, its complications and side effects are obstacles for the treatment of local residual and (or) local recurrent NPC. It will take considerable time to overcome these challenges. There is currently no standard clinical pathway for SRT for treating local residual and (or) local recurrent NPC. Thus, deadly complications still occur.

To our knowledge, this is the first and largest study that clarified the best management strategies regarding SRT for the treatment of local residual and (or) local recurrent NPC, considering the number of patients and clinical pathway initiatives.

To explore the reasons for the complications and side effects of SRT for the treatment of local residual and (or) local recurrent NPC, this study searched and summarized the full texts of relevant published articles in China from 1998 to 2012, including 1371 patients. The journals and their grades, the research hospital grades, the total radiation dose, the time of treatment or research on SRT, and follow-up duration were summarized and analyzed.

Variability in journal grade was also observed. Only two studies were published in an international journal, the International Journal Radiation Oncology, Biology, Physics. Among the 40 articles, research patient cohorts were used repeatedly in different articles. Thus, the quality of these 40 studies did not meet internationally accepted standards for a more formal tone.

In the context of hospital grade, research hospitals in China are of better quality, as assessed by Chinese standards.

This study observed variability in the total radiation dose, research or treatment time, and follow-up duration. The highest total radiation dose was 99.09 Gy. The longest and shortest research or treatment times were 6.33 and 1.25 years, respectively, and the longest and shortest follow-up durations were 8 years and 3 months, respectively.

To promote the quality of the studies and SRT, the total radiation dose, treatment time, and follow-up duration should be standardized.

The present analysis included 40 studies and 1,371 patients to explore the clinical pathway of SRT for local residual and (or) local recurrent NPC and provides information on these published articles, which can be accessed by medical professionals from the internet and libraries.

This meta-analysis has some limitations. First, the CNKI did not provide access for downloading the full text of all 40 of the published articles. Only the abstracts for some articles were included in the CNKI. Due to research limitations, the printed articles could not be obtained.

Third, some studies did not report radiation doses in Gy. Therefore, the statistical analysis did not include all 40 articles. Because some target information cannot be found on the CNKI. However, we have provided information on these articles and their publication journals for reference and further research.

In conclusion, this meta-analysis provided a large resource for further research and meta-analyses to identify the clinical pathway for SRT for the treatment of local residual and (or) local recurrent NPC.

The results of this study indicated that a lack of consistency in the total radiation dose, the research or treatment time, and the follow-up duration may contribute to complications and side-effects in SRT for the treatment of local residual and (or) local recurrent NPC.

The calculated average total radiation dose in this study, 16–33.6 Gy, may be referenced for future SRT for the treatment of local residual and (or) local recurrent NPC.

The calculated average follow-up time, 31.59 months, may be referenced in future research and clinical quality control.

The calculated average SRT research or treatment time, 3.51 years, may be referenced in future clinical practice.

Cooperation among multiple centers worldwide is required for meta-analyses of more studies on SRT for the treatment of local residual and (or) local recurrent NPC. Therefore, we propose this global effort.

Conflicts of interest

The authors indicate no potential conflicts of interest.

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