**Supplemental Table 1:**

A literature search was performed in PubMed based on the following search strategy, limited to English and humans, yielding the following number of publications:

'radiosurgery acoustic control' - 257 articles,

'radiosurgery vestibular control' - 185 articles,

'stereotactic radi* acoustic control' – 137 articles,

'stereotactic radi* vestibular control' – 86 articles.

For series with multiple publications, the most recent update of their experience was included, unless the earlier reports included higher dose regimens or other subgroup analyses useful for TCP modeling. Additional papers were identified in selected reviews on SRS for VS(2,31,49). After excluding manuscripts without correlates between dosimetric data and local tumor control, 35 papers were identified as adequate for data extraction and TCP analysis (Supplemental Table 2).

**Supplemental Table 2: Selected Data from Manuscripts Included in the Modeling**

| Manuscript Number | 1st Author | Year | Institution/Location | Number of Tumors | Total Dose (Gy) – Median | Prescription IsoDose Line (%) - Median | Number of Fractions | Tumor Control Rate at 3 years (%) | Tumor Control Rate at 5 years (%) | Delivery type | Definition of 'Tumor Progression' and details when provided |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ito(50) | 1997 | U Tokyo | 46 | 16.8 | 60% | 1 | 96 | | GK | Radiographic (maximum diameter) |
| 2 | Flickinger(51) | 1996 | U Pittsburgh | 273 | 15.5 | 50% | 1 | 95 | 91 | GK | Need for Surgical Intervention; Radiographic |
| 3 | Kondziolka(7) | 1998 | U Pittsburgh | 162 | 16 | 50% | 1 | 97 | | GK | Need for Surgical Intervention |
| 4 | Nakamura(52) | 2000 | Tohoku U | 78 | 13.3 | 50% | 1 | 91 | | GK | Radiographic - No volume increase |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | Andrews(53) | 2001 | Thomas Jefferson U | 69 | 12 | 50% | 1 | 98 | | GK | For patients with measurable hearing - tumor control per hearing status.<br>For patients without hearing - radiographic |
| 6 | Petit(54) | 2001 | U of Maryland | 45 | 12 | 50% | 1 | 96 | 96 | GK | Need for Surgical Intervention; Radiographic |
| 7 | Bertalanffy(55) | 2001 | U Vienna | 40 | 12 | 50% | 1 | | 91 | GK | Radiographic – progression is increasing size |
| 8 | Iwai(56) | 2003 | Oska City General | 51 | 12 | 50% | 1 | 92 | 92 | GK | Radiographic: Progression is 1 mm growth in 2 directions or 2 mm in one direction<br>Need for surgical intervention |
| 9 | Rowe(57) | 2003 | Royal Hallamshire H | 232 | 15 | 50% | 1 | | 92 | GK | Need for Surgical Intervention; Radiographic. |
| 10 | Meijer(30) | 2003 | VU | 49 | 12.5 | 80% | 1 | | 100 | Linac | Radiographic: Progression is >=2 mm of largest tumor diameter |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 80 | 25 | 80% | 5 | | 94 | | |
| 11 | Ishihara(58) | 2004 | Yamaguchi U | 38 | 17.0 | Not reported | 2.5 | 94 | | CK | Need for Surgical Intervention; Radiographic. |
| 12 | Myrseth (59) | 2005 | KHaukeland U | 103 | 12.2 | Not reported | 1 | | 89 | GK | Radiographic (<140% increase scored as 'unchanged') |
| 13 | Wowra(60) | 2005 | Munich | 111 | 13 | 55% | 1 | | 95 | GK | Not defined |
| 14 | Chung(32) | 2005 | Multi-Institutional - Taiwan | 195 | 13 | 57% | 1 | 97 | 95 | GK | Radiographic -progression is >10% increase in volume |
| 15 | Chopra(61) | 2007 | U Pittsburgh | 216 | 13 | 50% | 1 | 98 | | GK | Need for Surgical Intervention |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | Iwai(62) | 2008 | Osaka City General Hospital | 25 | 12.0 | 50% | 1 | | 96 | GK | Need for Surgical Intervention |
| 17 | Pollock(63) | 2009 | Mayo Clinic | 293 | 13 | 50% | 1 | 96 | 92 | GK | Need for Surgical Intervention; Radiographic – progression is tumor enlargement on 2 or more imaging studies |
| 18 | Fukuoka(64) | 2009 | Nakamura Memorial H | 152 | 12 | 50% | 1 | | 94 | GK | Progression is need for additional treatment (surgery or SRS) |
| 19 | Henzel(65) | 2009 | Multi-Institutional - Germany | 35 | 13 | 80% | 1 | | 88 | Linac | Radiographic – progression is increase of >2 mm |
| 20 | Murphy(66) | 2011 | Cleveland Clinic | 117 | 13 | 50% | 1 | | 91 | GK | Radiographic – progression is increase of >2 mm |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | Massager(67) | 2011 | Bordet Institute | 203 | 12 | 50% | 1 | 97 | | GK | Radiographic – progression is >10% increase in volume |
| 22 | Hansasuta(33) | 2011 | Stanford U | 383 | 18 | 80% | 3 | 99 | 96 | CK | Progression is need for additional treatment (surgery or SRS) |
| 23 | Timmer(68) | 2011 | Multi-Institutional - Netherlands | 100 | 11 | Not stated | 1 | 94 | | GK | No additional treatment needed; Radiographic – progression is >2 mm diameter or >10% volume increase |
| 24 | Yang(69) | 2011 | U Pittsburgh | 65 | 12 | 50% | 1 | 87 | 87 | GK | Radiographic – progression is >10% volume increase. |
| 25 | Collen(70) | 2011 | VU | 78 | 12.5 | 80% | 1 | 97 | 95 | Linac | No progression on successive MRI imaging |
| | | | | 41 | 30.0 | 95% | 3 | 97 | 95 | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | Kapoor(34) | 2011 | Johns Hopkins U | 385 | 25 | 80% | 5 | 97 | | Linac | Therapeutic success defined as tumor volume not increased and stable clinical status. Radiological progression defined as tumor volume larger but stable clinical status. |
| 27 | Wowra(71) | 2012 | Munich | 386 | 12.8 | 58% | 1 | | 95 | GK (n=257) CK (n=129) | Not defined |
| 28 | Varughese(72) | 2012 | U Bergen | 45 | 12 | 37% | 1 | | 94 | GK | Radiographic – progression is any increase; Progression is need for additional treatment |
| 29 | Milligan(73) | 2012 | Mayo Clinic | 22 | 12 | 50% | 1 | 82 | 82 | GK | No additional treatment needed; Radiographic – progression is >2 mm diameter |
| 30 | Hasegawa(74) | 2013 | Komaki City H | 440 | 12.8 | 50% | 1 | 94 | 93 | GK | Radiographic - progression is >2 mm diameter |
| 31 | Karam(75) | 2013 | Georgetown U | 37 | 25 | 80% | 5 | 91 | | CK | Radiographic – progression is >2mm increase in largest extra-meatal diameter |

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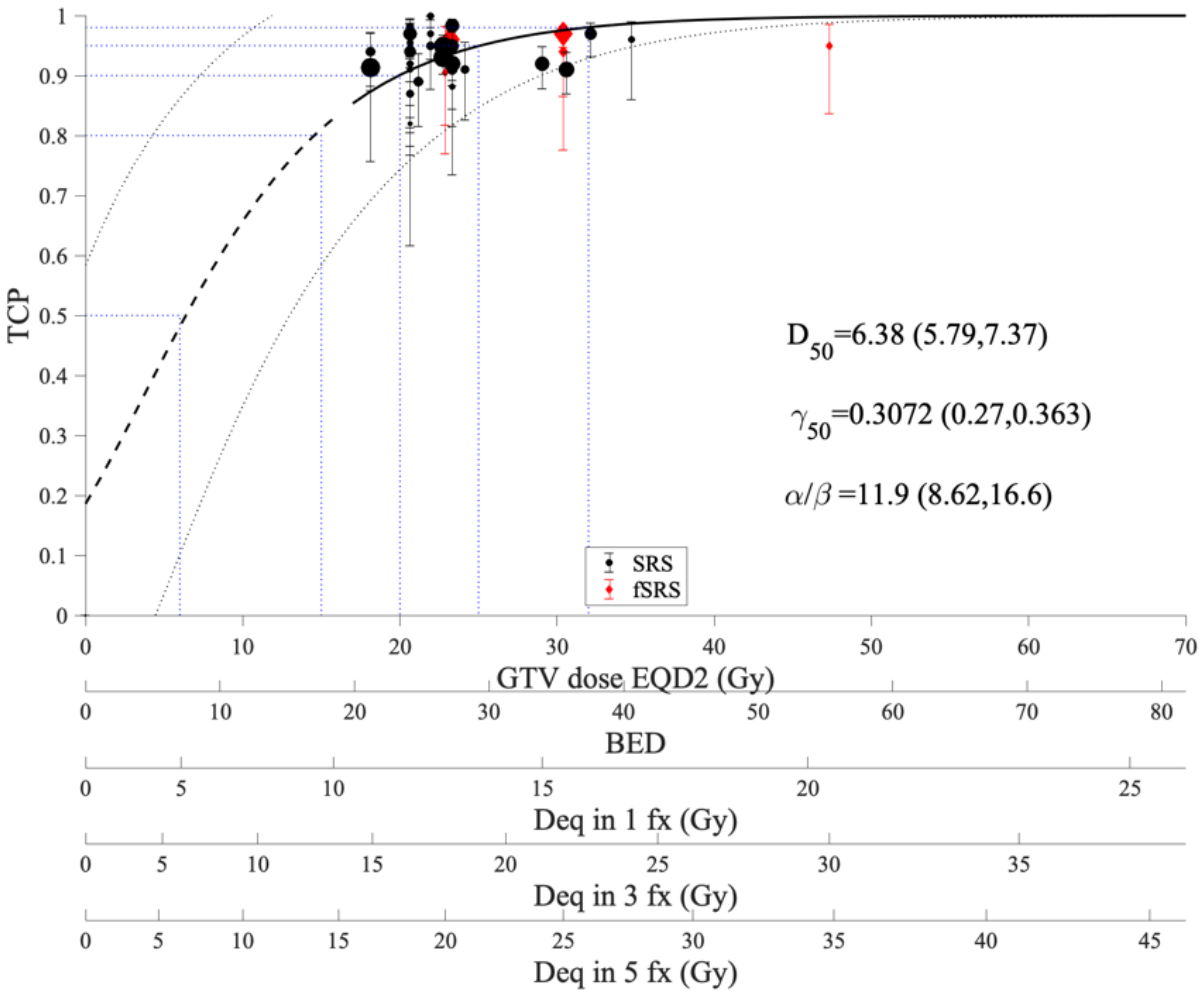
|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | Combs(76) | 2013 | U Heidelberg | 32 | 13 | 80% | 1 | 98 | 95 | Linac | Radiographic – by RECIST |
| 33 | Klijn(15) | 2016 | Multi-Institutional - Netherlands | 420 | 11.0 | Not stated | 1 | | 91 | GK | Requirement for additional treatment (triggered by diameter increase of >2 mm) |
| 34 | Schumacher(16) | 2017 | Northwestern U | 30 | 11.0 | 50% | 1 | | 91 | GK | Freedom from repeat surgical intervention and from persistent tumor growth. |
| 35 | Anderson(17) | 2014 | U Wisconsin | 48 | 12.5 | Not stated | 1 | | 97 | Linac | Need for Surgical Intervention; Radiographic – progression is >5 mm increase or >25% |
| | | | | 37 | 20.0 | Not stated | 5 | | 91 | | |

**Supplemental Figure 1. 3-5 year TCP with LQ model and TCP(0)=0%**

Tumor Control Probability (TCP) plot of vestibular schwannoma control following stereotactic radiosurgery (SRS – black dots) and hypo-fractionated SRS (fSRS – red dots) with the three parameters Poisson model and the observation point of TCP at 0 Gy set to 0% (i.e., the best-fit curve is not forced to go through the zero-dose point). The dotted line represents extrapolation of the curve where no data exist. EQD2 conversion was conducted using the LQ model. Conversion scales for biologically effective dose (BED), dose equivalent (Deq) in 1 fraction, 3 fractions, and 5 fractions are also provided (with a/b of 12.4). Error bars and bands represent 95% confidence levels. See Supplemental Table 3 for numerical details of the TCP(0)=30% and TCP(0)=0% models.



**Supplemental Table 3:** The predicted doses in 1, 3 and 5 fractions modeled for 3-5 year TCPs of 98%, 95%, 90%, 80% and 50% predicted by the LQ model with alpha/beta of 12.4 Gy with TCP(0)=30% and TCP(0)=0%. Note that there are no TCP data for less than the equivalent of 11 Gy in a single fraction, therefore the model outcomes represent extrapolation at doses below this level with a large range of error.

| Data Included in Model per Length of Follow-up | 3-5 Year TCP | EQD2 (Gy) | 1 fraction SRS equivalent dose (Gy) | 3 fraction fSRS equivalent dose (Gy) | 5 fraction fSRS equivalent dose (Gy) |
|---|---|---|---|---|---|
| LQ model from TCP(0)=30% fit (Figure 1) | 98% | 33 | 16.5 | 23.5 | 26.8 |
| | 95% | 25 | 13.8 | 19.2 | 21.5 |
| | 90% | 19 | 11.5 | 15.6 | 17.3 |
| | 80% | 13 | 8.8 | 11.5 | 12.6 |
| LQ model from TCP(0)=0% fit (Supplemental Figure 1) | 98% | 32 | 16.0 | 22.8 | 26.0 |
| | 95% | 25 | 13.6 | 19 | 21.5 |
| | 90% | 20 | 11.8 | 16.1 | 18 |
| | 80% | 14.5 | 9.4 | 12.5 | 13.8 |