

1 **Intracranial efficacy of selpercatinib in *RET* fusion-positive non-small cell**  
2 **lung cancers on the LIBRETTO-001 trial**

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## 47 **CONFLICT OF INTEREST STATEMENT**

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131 **TRANSLATIONAL RELEVANCE**

132 Brain metastases frequently occur in *RET* fusion-positive non-small cell lung cancers  
133 (NSCLCs), with an approximate 50% lifetime prevalence reported. Intracranial metastases  
134 are a major cause of morbidity and mortality in this patient population. Thus, there is a need  
135 for novel *RET*-directed, targeted therapy strategies with high efficacy. Selpercatinib, a  
136 selective and potent *RET* inhibitor, shows compelling preliminary evidence of activity in  
137 patients with brain metastases. This phase 1/2 trial (LIBRETTO-001) evaluated the efficacy  
138 and safety of selpercatinib in patients with *RET* fusion-positive NSCLCs with intracranial  
139 metastases. In this study, selpercatinib was well tolerated, achieving high intracranial  
140 response rate, and prolonged intracranial duration of response and intracranial progression-  
141 free survival. Combined, these results support selpercatinib as a new standard of care therapy  
142 for the primary treatment of brain metastases for patients with *RET* fusion-positive NSCLC.

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156 **ABSTRACT**

157 **Purpose:** We report the intracranial efficacy of selpercatinib, a highly potent and selective  
158 RET inhibitor, approved in the US for *RET* fusion-positive non-small cell lung cancers  
159 (NSCLCs).

160 **Methods:** In the global phase 1/2 LIBRETTO-001 trial (NCT03157128) in advanced *RET*-  
161 altered solid tumors, selpercatinib was dosed orally (160mg twice/day) in 28-day cycles.  
162 Patients with baseline intracranial metastases had MRI/CT scans every 8-weeks for 1 year  
163 (12-weeks thereafter). In this pre-planned analysis of *RET* fusion-positive NSCLC patients  
164 with baseline intracranial metastases, the primary endpoint was independently-assessed  
165 intracranial objective response rate (ORR) per RECIST 1.1. Secondary endpoints included  
166 intracranial disease control rate, intracranial duration of response, and intracranial  
167 progression-free survival (PFS) independently reviewed.

168 **Results:** Eighty NSCLC patients had brain metastases at baseline. Patients were heavily  
169 pretreated (median=2 systemic therapies, range=0–10); 56% of patients received  $\geq 1$  course of  
170 intracranial radiation (14% whole brain radiotherapy, 45% stereotactic radiosurgery). Among  
171 22 patients with measurable intracranial disease at baseline, intracranial ORR was 82%  
172 (95%CI=60–95), including 23% with complete responses. Among all intracranial responders  
173 (measurable and non-measurable, n=38), median duration of intracranial response was not  
174 reached (95%CI=9.3–NE) at a median duration of follow-up of 9.5 months (IQR=5.7,12.0).  
175 At 12 months, 55% of intracranial responses were ongoing. In all 80 patients, median  
176 intracranial PFS was 13.7 months (95%CI=10.9-NE) at a median duration of follow-up of  
177 11.0 months (IQR=7.4,16.5). No new safety signals were revealed in patients with brain  
178 metastases compared to the full NSCLC trial population.

179 **Conclusion:** Selpercatinib has robust and durable intracranial efficacy in *RET* fusion-positive  
180 NSCLC patients.

181 **INTRODUCTION**

182

183 The *RET* (rearranged during transfection) proto-oncogene encodes the RET receptor tyrosine  
184 kinase, a transmembrane glycoprotein that is involved in the development and maintenance  
185 of several tissue types.<sup>1</sup> Activating *RET* alterations, such as recurrent gene fusions, lead to  
186 ligand-independent, constitutively active RET tyrosine kinase signaling that drives  
187 oncogenesis and tumor progression.<sup>2-4</sup> Oncogenic *RET* fusions are found in 1-2% of non-  
188 small cell lung cancers (NSCLCs).<sup>5,6</sup> A global multi-institutional registry of patients with  
189 *RET* fusion-positive NSCLC found that approximately half of these patients develop brain  
190 metastases during their lifetime;<sup>7</sup> leptomeningeal disease has also been observed.<sup>8</sup>

191

192 Intracranial sanctuary site metastasis is a liability shared by many other oncogene-addicted  
193 cancers, including *EGFR*-mutant or *ALK* fusion-positive NSCLCs. A major advance in the  
194 management of these tumors has been the development of brain-penetrant tyrosine-kinase  
195 inhibitors.<sup>9,10</sup> These agents not only prevent or delay intracranial treatment failure, but are  
196 also increasingly utilized as primary therapy for patients with brain metastases instead of  
197 localized interventions such as radiotherapy, an intervention potentially associated with long-  
198 term quality of life impairment.<sup>11</sup>

199

200 Selpercatinib (LOXO-292), a highly potent and selective RET inhibitor, has marked and  
201 durable efficacy in patients with treatment-naïve or platinum chemotherapy-treated *RET*  
202 fusion-positive NSCLCs.<sup>12</sup> Based on these data, selpercatinib has received approval in the US  
203 for any line of therapy of *RET* fusion-positive metastatic NSCLCs, and is the first RET-  
204 selective inhibitor granted EU approval.<sup>13,14</sup> Given that several *RET* fusion-positive cancers  
205 harbor a proclivity for intracranial metastasis, selpercatinib was specifically designed to  
206 achieve levels in the central nervous system (CNS) necessary to inhibit RET. Consistently,



207 selpercatinib demonstrated robust intracranial efficacy in orthotopically implanted *RET*  
208 fusion-positive tumors in mice.<sup>15</sup>  
209  
210 Preclinical observations, anecdotal case reports<sup>8,15</sup> and preliminary experience from a  
211 prospective clinical trial<sup>7</sup> suggest that selpercatinib is active in patients with brain  
212 metastases. To date, however, the true intracranial efficacy of selpercatinib in a large  
213 prospective series of *RET* fusion-positive NSCLCs remains unknown. To address this key  
214 evidence gap, we conducted a pre-planned analysis of selpercatinib in patients with *RET*  
215 fusion-positive NSCLC and brain metastases enrolled to the global phase 1/2 LIBRETTO-  
216 001 trial (NCT03157128).

217

## 218 **METHODS**

### 219 *Study design and treatment*

220 LIBRETTO-001 is an ongoing, global, first-in-human, open label, phase 1/2 clinical trial  
221 (ClinicalTrials.gov NCT03157128) open at 89 investigative sites in 16 countries. A total of  
222 31 sites from 11 countries enrolled at least one patient with a *RET* fusion-positive NSCLC  
223 and investigator-assessed brain metastases at baseline in the analysis dataset used here. Full  
224 details of the trial design have been published.<sup>12</sup> Briefly, patients eligible for this pre-planned  
225 analysis were required to meet the following inclusion criteria: age  $\geq 12$  years; presence of a  
226 prospectively-identified *RET* fusion as determined by locally-obtained testing performed in a  
227 certified laboratory; ECOG performance status 0–2; adequate organ function; and a QTc  
228 interval of  $\leq 470$  msec. Any number of prior therapies were permitted. Brain imaging was a  
229 requirement at baseline for all *RET* fusion-positive solid tumor NSCLC patients. Magnetic  
230 resonance imaging (MRI) was preferred; computerized tomography (CT) with contrast was  
231 acceptable if MRI was contraindicated. Patients with known brain metastases were eligible



232 for the trial if neurological symptoms and CNS imaging were stable and their steroid dose  
233 was stable for 14 days prior to the first dose of selpercatinib, and no CNS surgery or radiation  
234 had been performed for 28 days (14 days for stereotactic radiosurgery/SRS) prior to dosing.  
235 All prior local treatments for CNS disease (e.g., surgery, whole brain radiation, SRS), the  
236 start and stop dates for each prior local therapy, and the specific lesions treated (if SRS and/or  
237 surgery) were recorded. For patients who had received CNS radiation prior to the trial,  
238 intracranial lesions needed to show post-radiation progression to be selected as a target lesion  
239 at baseline.

240

241 This protocol adhered to the principles of the Declaration of Helsinki and the Good Clinical  
242 Practice Guidelines of the International Conference on Harmonization. The institutional  
243 review board of each investigative site approved the trial, and all patients provided written  
244 informed consent.

245

246 Selpercatinib doses ranged from 20 mg once daily to 240 mg twice daily for patients enrolled  
247 in the phase 1 dose escalation portion of the study. Dose escalation to dose levels determined  
248 to be safe was allowed for phase 1 patients after a minimum of 1 cycle of treatment. In the  
249 phase 2 portion of the study, selpercatinib was dosed orally at 160 mg twice daily (BID) in  
250 28-day continuous cycles. Treatment continued until death, progressive disease, unacceptable  
251 toxicity, or withdrawal of consent. Patients could continue selpercatinib treatment after  
252 documented progression if they were continuing to derive clinical benefit in the opinion of  
253 the investigator.

254

255 The main efficacy endpoint for the current analysis was intracranial objective response rate  
256 (ORR) by RECIST 1.1<sup>16</sup> determined by an independent review committee (IRC), a pre-

257 planned secondary endpoint for the overall LIBRETTO-001 program. The IRC was  
258 composed of expert radiologists who were blinded to investigator-determined systemic  
259 response. IRC radiologists were provided with prior or on-study radiation information and a  
260 history of all prior treatments for CNS disease. Intracranial ORR (%) was defined as the  
261 proportion of patients with a best overall intracranial response of complete response (CR) or  
262 partial response (PR) relative to the total number of patients with baseline intracranial  
263 disease. All responses were required to be confirmed by a repeat assessment performed no  
264 sooner than 28 days later. Intracranial disease control rate (DCR) was defined as the  
265 percentage of patients who had a best overall intracranial response of CR, PR, or stable  
266 disease (SD) lasting 16 weeks or more after selpercatinib initiation. Consistent with RECIST  
267 1.1, patients with exclusively non-measurable intracranial disease at baseline could be  
268 classified for best overall response as CR (in the case where all non-measurable lesions  
269 resolved), progressive disease (PD), or non-CR/non-PD. Another pre-specified secondary  
270 endpoint was intracranial duration of response (DoR) as determined by IRC, defined as the  
271 time from start of an intracranial response until intracranial progression or death, regardless  
272 of cause. Intracranial progression-free survival (PFS) was an exploratory endpoint defined as  
273 the time from treatment start to intracranial disease progression as assessed by IRC or death  
274 from any cause. Extracranial progression was not included in the intracranial PFS assessment.  
275 Safety was another exploratory endpoint for the population with NSCLC and intracranial  
276 metastases.

277

### 278 ***Trial Assessments***

279 Radiological tumor assessments (MRI, preferentially; computerized tomography CT, with  
280 and without intravenous contrast when MRI was clinically contraindicated) were conducted  
281 at baseline for all phase 2 *RET* fusion-positive solid tumor NSCLC patients. Repeat brain

282 imaging using the same modality as at baseline was conducted for all patients with brain  
283 metastases identified by baseline imaging every 8 weeks for 1 year, and every 12 weeks  
284 thereafter. Safety was assessed according to the National Cancer Institute Common  
285 Terminology Criteria for Adverse Events (version 4.03).<sup>17</sup>

286

### 287 *Statistical Analysis*

288 All analyses were pre-specified in the Statistical Analysis Plan. The Clopper-Pearson method  
289 was used to construct 95% CIs for response rates. Kaplan-Meier method was used to estimate  
290 median for intracranial DoR and PFS. Median follow up was calculated using the reverse  
291 Kaplan Meier method, i.e. median follow up is calculated like the Kaplan-Meier estimate of  
292 the survival function, but with the meaning of the status indicator reversed so that the event  
293 of interest becomes the censor. SAS statistical software, version 9.2 (SAS Institute, Cary,  
294 NC) was used to perform all analyses.

295

### 296 *Data Sharing*

297 Eli Lilly and Company provides access to all individual participant data collected during the  
298 trial, after anonymization, with the exception of pharmacokinetic or genetic data. Data are  
299 available to request 6 months after the indication studied has been approved in the USA and  
300 EU and after primary publication acceptance, whichever is later. No expiration date of data  
301 requests is currently set once they are made available. Access is provided after a proposal has  
302 been approved by an independent review committee identified for this purpose and after  
303 receipt of a signed data sharing agreement. Data and documents, including the study protocol,  
304 statistical analysis plan, clinical study report, and blank or annotated case report forms will be  
305 provided in a secure data sharing environment for up to 2 years per proposal. For details on  
306 submitting a request, see the Vivli website: [www.vivli.org](http://www.vivli.org).

307 **RESULTS**

308 *Baseline patient characteristics and treatment*

309 A total of 531 patients with *RET* fusion-positive cancers were enrolled to phase 1 or phase 2  
310 of the trial between May 2017 and June 17, 2019, including 80 patients with *RET* fusion-  
311 positive NSCLC and investigator-determined baseline brain metastases (92.5% by MRI, 5%  
312 by CT, 2.5% missing) that met criteria for inclusion in the current analysis (online appendix,  
313 Figure S1). Among these 80 patients, 22 patients had at least one baseline measurable  
314 intracranial lesion and 58 had exclusively non-measurable baseline intracranial lesions.

315

316 The demographic and disease characteristics of patients with baseline brain metastases are  
317 summarized in Table 1. The median age was 62 years (range 36–86 years), and most patients  
318 had an ECOG performance status of zero or one. Consistent with previous analyses, the most  
319 common *RET* fusion partner was *KIF5B* (70% of patients). Most patients had received prior  
320 systemic therapy (91%), with a median of two prior treatments (range 0–10), including 79%  
321 of patients who were treated with platinum-based chemotherapy and 41% of patients who  
322 were treated with one or more multi-kinase inhibitors. Prior therapy for brain metastases  
323 included surgery in 9%, stereotactic radiosurgery in 45%, and whole brain radiotherapy  
324 (WBRT) in 14% of patients. Of the 45 patients who received prior cranial radiotherapy, 73%  
325 had completed this therapy at least 2 months prior to beginning seliperatinib treatment.

326

327 At the time of data cut-off, 46 of the 80 NSCLC patients with brain metastases (58%)  
328 remained on therapy with seliperatinib; 23 of the 80 patients (29%) had discontinued  
329 treatment due to progressive disease (any progressive disease, not limited to intracranial  
330 metastases progression) (online appendix, Table S1). After accounting for intra-patient dose

331 escalation permitted during the phase 1 portion of the trial, 95% of patients received at least  
332 one dose of selpercatinib at the recommended phase 2 dose of 160 mg twice daily.

333

### 334 *Selpercatinib intracranial efficacy*

335 At the time of the data cutoff, the median duration of follow-up was 9.5 months (interquartile  
336 range, IQR 5.7, 12.0 months). Among the 22 patients with measurable intracranial disease at  
337 baseline, the intracranial ORR was 82% (95% CI = 60–95), including 23% with a complete  
338 response and 59% with a partial response (Table 2, Figure 1). In addition, 18% of patients  
339 exhibited stable disease as the best response to selpercatinib. Because all the patients  
340 achieved a tumor response or disease stabilization, the intracranial disease control rate was  
341 100%. Among the subset of eight patients with measurable disease and prior cranial  
342 radiotherapy, the intracranial ORR was 75% (six of eight patients responding, 95% CI = 35–  
343 97) (online appendix, Table S2). The intracranial ORR for patients without prior cranial  
344 radiotherapy was 86% (12 of 14 patients responding, 95% CI = 57–98).

345

346 Among the remaining 58 patients with exclusively non-measurable intracranial disease at  
347 baseline, 34% (20 of 58 patients) achieved a complete intracranial response on the basis of  
348 complete resolution of all non-measurable lesions and 29 patients had non-CR/non-PD (CR  
349 and non-CR/non-PD corresponds to the clinical benefit rate for non-measurable intracranial  
350 disease). Only five patients (9%) had progressive disease as best intracranial response (online  
351 appendix, Table S3).

352

353 Thirty-eight patients from the 80-patient population (48%) with baseline brain metastases had  
354 an intracranial response to selpercatinib. Among this group of responders, the median  
355 intracranial DoR was not reached (95% CI = 9.3, NE) (Table 3, Figure 2A) at a median

356 duration of follow-up of 9.5 months (IQR 5.7,12.0). Overall, 71% were censored at the time  
357 of the analysis. At 1-year, 55% (95% CI = 32–73) of intracranial responses were ongoing. Of  
358 note, the longest intracranial response was ongoing at 21.2 months. Among all 80 patients,  
359 the median intracranial PFS was 13.7 months (Table 3, Figure 2B), although this median  
360 estimate is unstable as only 30 patients (38%) had experienced an event at a median duration  
361 of follow-up of 11.0 months (IQR 7.4,16.5). Time to response and response duration are  
362 displayed in Figure 3 for all responders (n=38).

363

### 364 *Selpercatinib safety*

365 Among patients with NSCLC and baseline brain metastases, selpercatinib treatment was  
366 associated with a low rate of treatment discontinuation due to adverse events judged by the  
367 investigator as possibly related to selpercatinib treatment (TRAEs) (3%, two of 80 patients).  
368 Table S4 summarizes total (all grade) treatment-emergent adverse events (TEAEs) and  
369 TRAEs. TEAEs and TRAEs were reported at similar levels in patients with baseline  
370 intracranial disease as in all *RET* fusion-positive NSCLCs with and without intracranial  
371 disease (n=253).

372

373 Among patients with intracranial disease, most TEAEs and TRAEs were low grade (Table  
374 S5). The only TEAEs reported as grade 3/4 in >10% of patients with NSCLC and baseline  
375 brain metastases were alanine aminotransferase (ALT) increase (18%), aspartate  
376 aminotransferase (AST) increase (11%), hypertension (21%, all grade 3), and hyponatraemia  
377 (11%). Grade 3/4 elevated ALT and AST and hypertension were reported at similar levels as  
378 TRAEs. No Grade 5 TRAEs were reported among the patients with NSCLC and baseline  
379 brain metastases.

380

381 **DISCUSSION**

382 Intracranial metastases are a major cause of morbidity and mortality for patients with  
383 oncogene-addicted cancers. The results of this global, multicenter study demonstrate that  
384 selpercatinib has robust intracranial efficacy by blinded independent review of patients with  
385 *RET* fusion-positive NSCLCs and brain metastases. The drug achieved a high intracranial  
386 response rate and the intracranial duration of response and intracranial progression-free  
387 survival were prolonged. Moreover, selpercatinib treatment was well tolerated in this patient  
388 population, with no new safety signals identified. Taken together, these data support  
389 selpercatinib as a new standard of care for primary treatment of brain metastases for patients  
390 with *RET* fusion-positive NSCLC. Comprehensive molecular profiling analysis is warranted  
391 in the future to further analyze the biomarkers of intracranial response and resistance to  
392 selpercatinib.

393

394 The intracranial activity of selpercatinib in this phase 1/2 trial is broadly consistent with the  
395 intracranial activity observed with other contemporary targeted therapies for genomically-  
396 driven NSCLCs. In *ALK* fusion-positive lung cancers, alectinib achieved an intracranial ORR  
397 of 64%, an intracranial disease control rate of 90%, and durable disease control (median  
398 intracranial duration of response of 10.8 months) among patients with measurable disease in a  
399 comparable analysis of two single arm phase 2 trials.<sup>10</sup> At 6 months, 58% of patients were  
400 progression/death-free. In *EGFR*-mutant lung cancers, osimertinib achieved an intracranial  
401 ORR of 54% and an intracranial disease control rate of 92% in a pooled analysis of two phase  
402 2 trials.<sup>18</sup> At 6 months, 72% of patients were intracranial progression/death-free. By  
403 comparison, selpercatinib treatment resulted in an intracranial ORR of 82% and an  
404 intracranial disease control rate of 100%, and at 6 months, 79% of patients were intracranial  
405 progression/death-free. Median intracranial duration of response was not reached (95% CI =



406 9.3, NE). Both alectinib and osimertinib are recognized as standards of care for tyrosine  
407 kinase inhibitor-naïve patients with *ALK* fusion-positive and *EGFR*-mutant lung cancers,  
408 respectively, similar to the role of selpercatinib in *RET* fusion-positive lung cancers.

409

410 Selpercatinib's activity in the CNS has important implications beyond *RET* fusion-positive  
411 NSCLCs with brain metastases. A complete response to selpercatinib in leptomeningeal  
412 disease has already been described in a patient with *RET* fusion-positive NSCLC,<sup>8</sup>  
413 demonstrating the activity of the drug beyond parenchymal disease. Selpercatinib has been  
414 shown to be active against intracranial metastases in a patient with *RET* fusion-positive  
415 thyroid cancer,<sup>19</sup> a patient with *RET*-mutant medullary thyroid cancer,<sup>20</sup> and a pediatric  
416 patient with *RET* fusion-positive congenital mesoblastic nephroma.<sup>21</sup> LIBRETTO-001  
417 continues to enroll patients with non-lung/non-thyroid cancers that harbor *RET* fusions or  
418 mutations. Additional confirmation of the drug's activity in this setting will help establish the  
419 overall impact of selpercatinib on intracranial disease in patients with *RET*-dependent  
420 cancers of any histology in both adult and pediatric populations.

421

422 While this prospective, pre-planned, independently-reviewed analysis has many strengths, it  
423 does have some important limitations. Patients in this cohort had received a variety of both  
424 systemic and local therapies for management of their *RET* fusion-positive NSCLCs. Despite  
425 this, intracranial activity was observed across various treatment subgroups. In addition, at the  
426 time of analysis, a majority of patients remained progression-free and a majority of responses  
427 were ongoing; thus, stable medians could not be estimated. Ongoing follow-up will reveal  
428 more precise estimates of intracranial response durability and progression-free survival.  
429 Moreover, this study did not specifically address whether selpercatinib can prevent or delay  
430 intracranial progression in patients with NSCLC that begin treatment without intracranial

431 involvement. As a phase 1/2 trial, LIBRETTO-001 did not require head and neck MRI/CT  
432 scans during treatment unless intracranial disease was identified at baseline and the trial  
433 could not address this question. Intriguingly, other tyrosine kinase inhibitors with substantial  
434 intracranial activity have already been shown to prolong the time to the acquisition of central  
435 nervous system metastases in fusion-positive lung cancers compared to earlier-generation  
436 kinase inhibitors with less optimal intracranial activity.<sup>22,23</sup> However, there is a lack of  
437 prospective data evaluating long-term outcomes of tyrosine kinase inhibitors alone compared  
438 to SRS and tyrosine kinase inhibitors in managing brain metastases.

439

440 Selpercatinib is currently being evaluated in LIBRETTO-431 (NCT04194944), an ongoing  
441 randomized, global, phase 3 study of selpercatinib versus platinum-pemetrexed with or  
442 without pembrolizumab in treatment-naïve patients with *RET* fusion-positive NSCLCs. This  
443 trial will allow the further characterization of selpercatinib activity in patients with NSCLC  
444 and intracranial metastases.

445

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453

454

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532

533 **Table 1. Demographic and disease characteristics of patients with *RET* fusion-positive**  
 534 **NSCLC and intracranial disease**

Characteristics	All patients with <i>RET</i> fusion-positive NSCLC and intracranial metastases (N=80)
<b>Age</b>	
Median (range), years	62 (36–86)
<b>Sex, n (%)</b>	
Female	54 (68)
Male	26 (33)
<b>Race, n (%)</b>	
White	44 (55)
Asian	31 (39)
Black or African American	2 (3)
Other	2 (3)
Unknown	1 (1)
<b>Smoking history, n (%)</b>	
Never	63 (79)
Former	16 (20)
Current	1 (1)
<b>ECOG performance status, n (%)</b>	
0	22 (28)
1	54 (68)
2	4 (5)
<b>NSCLC histological subtype, n (%)</b>	
Adenocarcinoma	69 (86)
Large cell neuroendocrine carcinoma	2 (3)
NSCLC-NOS	8 (10)
Other	1 (1)
<b><i>RET</i> fusion partner, n (%)</b>	
<i>KIF5B</i>	56 (70)
<i>CCDC6</i>	11 (14)
<i>NCOA4</i>	2 (3)
Other	4 (5)
Unknown <sup>a</sup>	7 (9)
<b>Prior therapy, n (%)</b>	
Number of prior systemic regimens	
0	7 (9)
1–2	43 (54)
3 or more	30 (38)
Median prior systemic regimen (range)	2 (0–10)
Type of prior systemic therapy <sup>b</sup>	
Platinum chemotherapy	63 (79)
Anti PD-1/PD-L1 antibody	43 (54)
Multi-kinase inhibitor	33 (41)
Taxane chemotherapy	25 (31)
Other systemic therapy	31 (39)
Intracranial radiotherapy <sup>b</sup>	
Whole brain radiation therapy	11 (14)
Stereotactic radiosurgery	36 (45)
Intracranial radiotherapy timing	
Completed >2 months prior to selpercatinib treatment	33 (41)
Intracranial surgery	7 (9)

535 <sup>a</sup> *RET* fusion identified by molecular analysis with an assay unable to identify the fusion partner (e.g. fluorescence in situ hybridization).

536 <sup>b</sup> Patients may be counted in more than one row.



537 **Table 2. Intracranial tumor response by independent review committee assessment in**  
538 **patients with *RET* fusion-positive NSCLC and measurable intracranial disease per**  
539 **RECIST 1.1.**

	<b>Patients with measurable intracranial disease (N=22)</b>
Intracranial objective response rate, n (%)	18 (82)
95% confidence interval <sup>a</sup>	60 – 95
Intracranial best overall response, n (%)	
Complete response	5 (23)
Partial response	13 (59)
Stable disease	4 (18)
Progressive disease	0
Intracranial disease control rate, n (%) <sup>b</sup>	22 (100)

540 <sup>a</sup> 95% confidence interval was calculated using Clopper-Pearson method.

541 <sup>b</sup> Intracranial disease control rate was defined as the percentage of patients who had a best overall intracranial response of complete  
542 response, partial response, or stable disease lasting 16 weeks or more after seliprecatinib initiation.

543

544

545

546

547 **Table 3. Duration of intracranial tumor response and intracranial progression-free**  
 548 **survival by independent review committee assessment in patients with *RET* fusion-**  
 549 **positive NSCLC and measurable and non-measurable intracranial disease**

	Total patients (N=80)
<b>Duration of intracranial response</b>	
Responders <sup>a</sup>	38
Censored, n (%) <sup>b</sup>	27 (71)
Intracranial duration of response, median (months) (95% CI) <sup>c,d</sup>	NE (9.3–NE)
Intracranial duration of follow-up, median (months) (IQR) <sup>c</sup>	9.5 (5.7, 12.0)
Intracranial duration of response <sup>c,e</sup>	
% of patients ≥6 months (95% CI)	91 (75–97)
% of patients ≥12 months (95% CI)	55 (32–73)
<b>Progression-free survival</b>	
Censored, n (%) <sup>b</sup>	50 (62.5)
Median, months (95% CI) <sup>c,d</sup>	13.7 (10.9–NE)
Median follow-up, (months) (IQR) <sup>c</sup>	11.0 (7.4, 16.5)
% progression/death-free <sup>c,e</sup>	
≥6 months (95% CI)	79 (68–87)
≥12 months (95% CI)	55 (41–67)

550 Abbreviations: CI, confidence interval; IQR, interquartile range; NE, not estimable

551 <sup>a</sup> Patients with intracranial best response of CR or PR based on independent review committee assessments using RECIST (version 1.1).

552 <sup>b</sup> Status as of the patient's last disease assessment on or before 16 Dec 2019.

553 <sup>c</sup> Estimate based on Kaplan-Meier method.

554 <sup>d</sup> 95% confidence interval was calculated using Brookmeyer and Crowley method.

555 <sup>e</sup> 95% confidence interval was calculated using Greenwood's formula.

## Figure Legend

**Figure 1. Intracranial response to selpercatinib.** A waterfall plot of the maximum change in intracranial tumor size is shown for the 22 patients with measurable disease at baseline. Vertical bars represent the best percent change from baseline in the sum of diameters for all intracranial target lesions, with the color of the bar representing the corresponding tumor response designation. Symbols represent prior stereotactic radiosurgery (SRS) and prior systemic therapies. Note: because the intracranial best overall response in Table 2 is based on RECIST 1.1 requirements, including the need for a confirmatory scan, the tumor response designation does not exactly correlate with table data.

Abbreviations: MKI, multi-kinase inhibitor

**Figure 2. Kaplan-Meier plot of (A) intracranial duration of response and (B) intracranial progression-free survival.** (A) The plot depicts the duration of response for all responding patients with measurable or non-measurable intracranial metastases. (B) The plot was constructed with data derived from all patients with measurable or non-measurable intracranial metastases treated with selpercatinib.

Abbreviations: DoR, duration of response; NE, non-estimable; PFS, progression-free survival

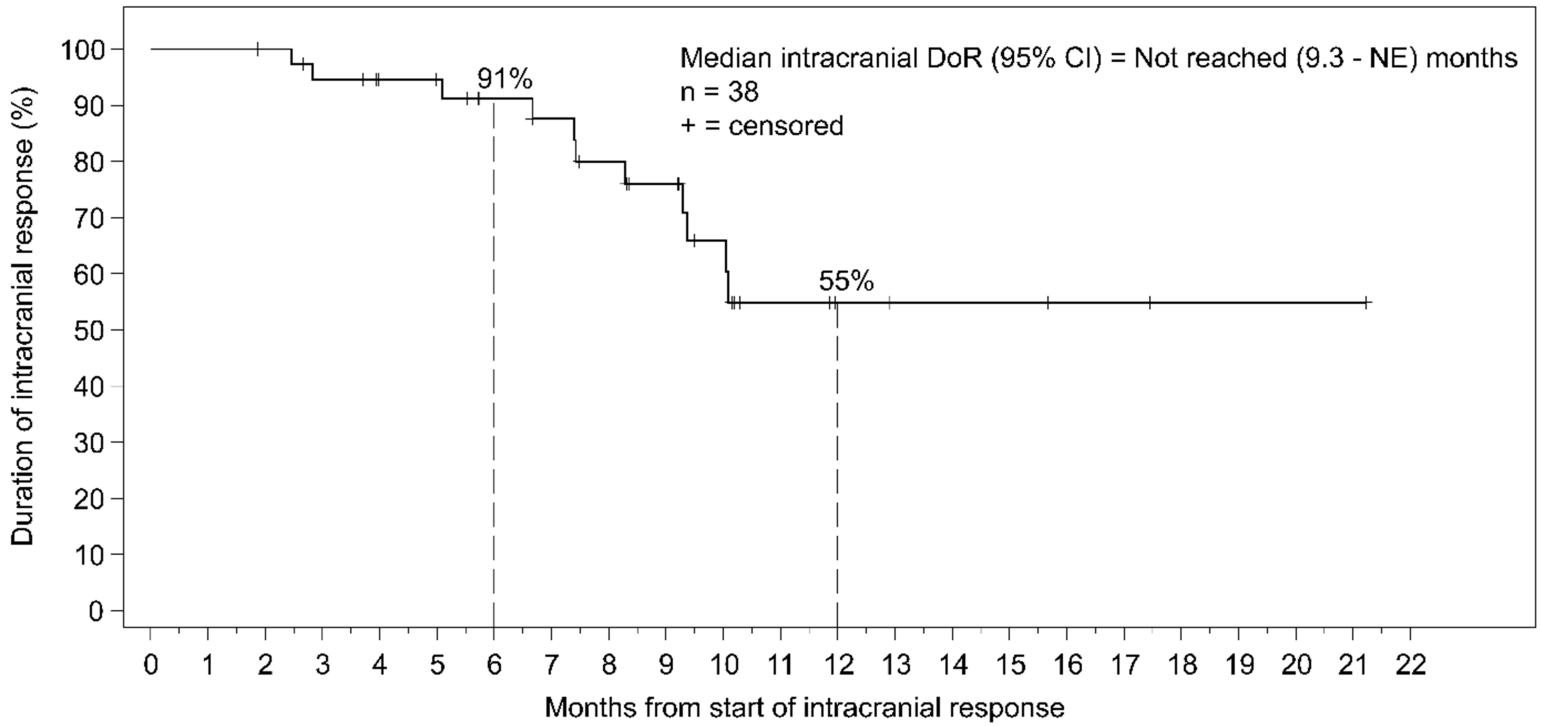
## **Figure 3. Duration of selpercatinib therapy.**

Treatment duration, time to intracranial response, and intracranial progression events are shown in this swimmer's plot for patients with measurable and non-measurable intracranial disease (n=38). The complete and partial response symbols indicate the time of the first scan showing an intracranial response (that was then confirmed at a subsequent assessment).



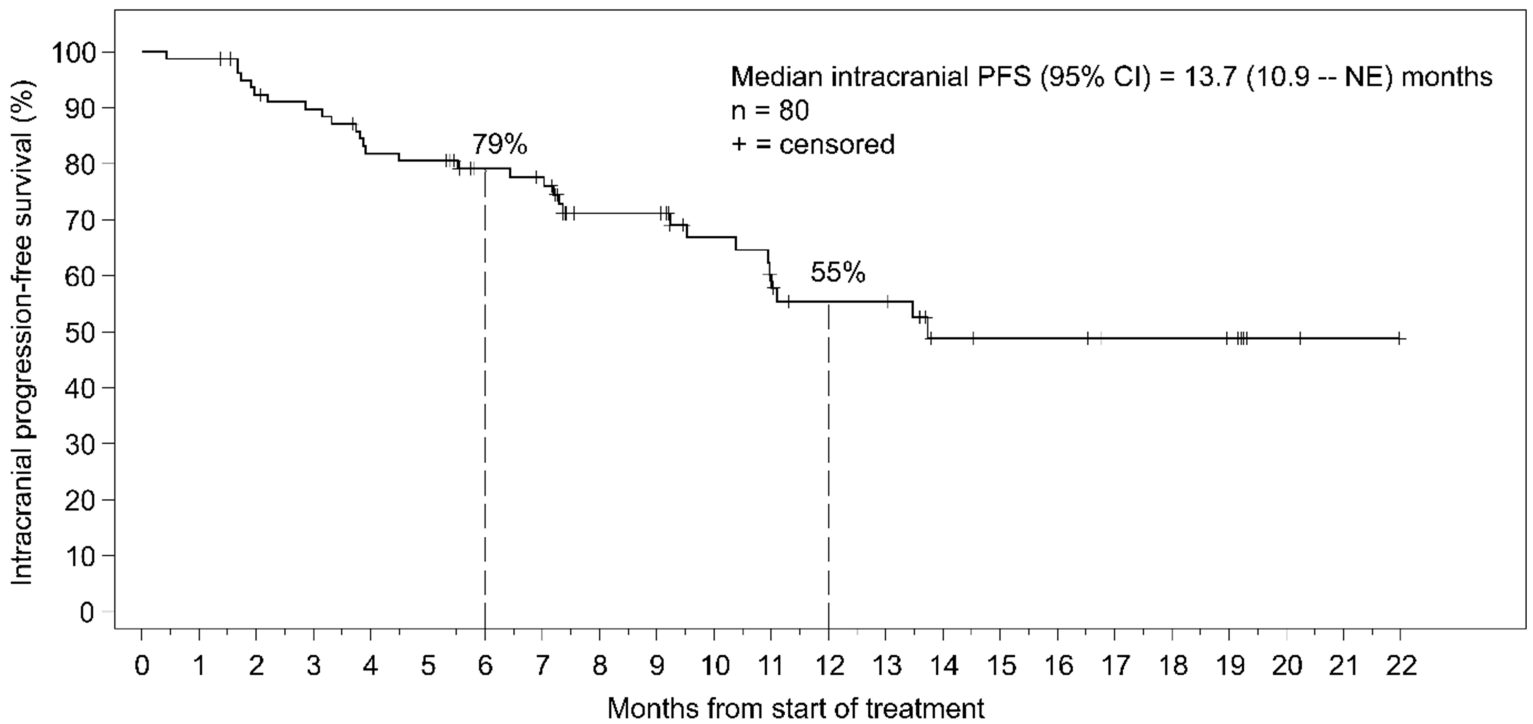
# Figure 2

## A



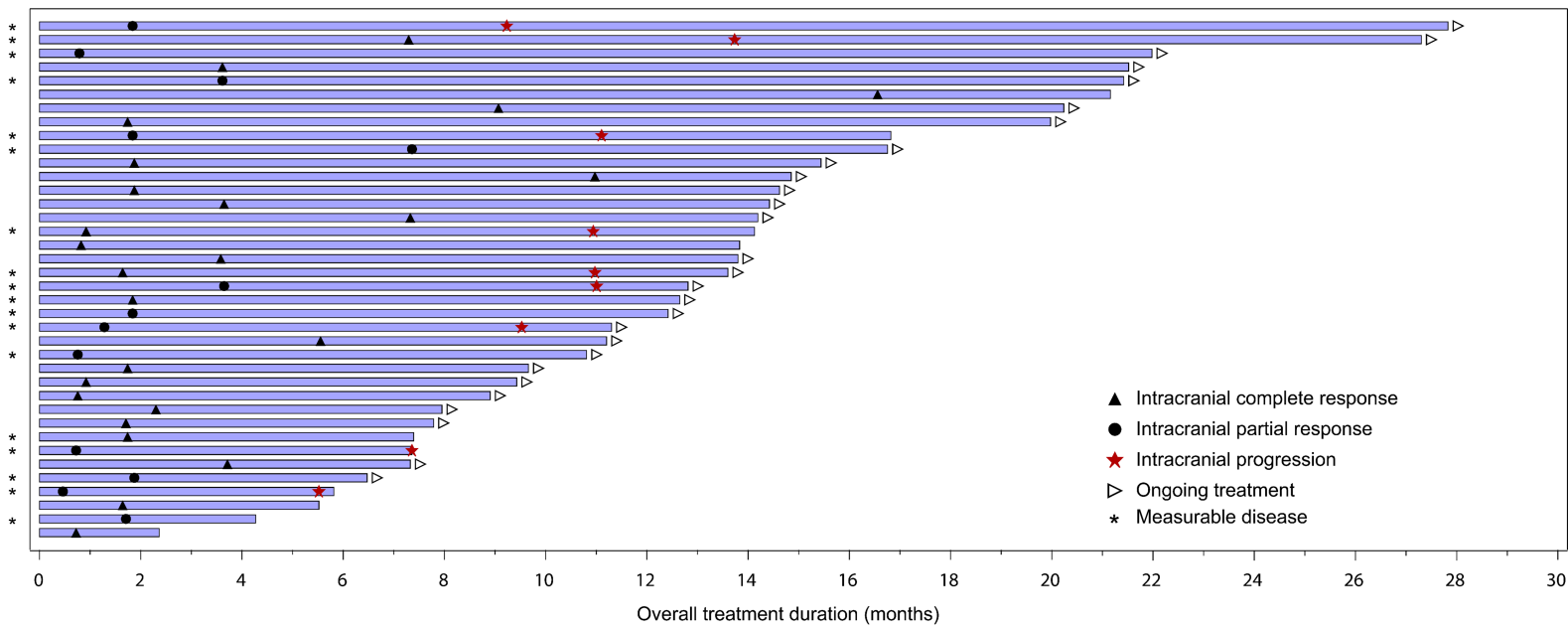
No. at Risk: 38 38 37 34 30 29 25 23 20 17 12 7 5 4 4 4 2 2 1 1 1 1 0

## B



No. at Risk: 80 79 72 69 62 61 52 50 38 38 30 26 21 21 11 10 10 8 8 7 2 1 0

Figure 3



# Clinical Cancer Research

## Intracranial efficacy of selpercatinib in RET fusion-positive non-small cell lung cancers on the LIBRETTO-001 trial

Vivek Subbiah, Justin F. Gainor, Geoffrey R. Oxnard, et al.

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