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Year	First author	ICI type	ICI name	Cancer type	Study type	Total no. of patients
2018	Fang et al. [1]	Anti-PD-1	Camrelizumab	Nasopharyngeal carcinoma	Single-arm study	116
2019	Nie et al. [2]	Anti-PD-1	Camrelizumab	Hodgkin lymphoma	Single-arm study	86
2019	Song et al. [3]	Anti-PD-1	Camrelizumab	Hodgkin lymphoma	Single-arm study	75
2019	Wei et al. [4]	Anti-PD-1	Camrelizumab	Non-small cell lung cancer	Single-arm study	21
2020	Lickliter et al. [5]	Anti-PD-1	Camrelizumab	Advanced solid tumors	Single-arm study	49
2020	Chen et al. [6]	Anti-PD-1	Camrelizumab	Hepatocellular carcinoma	Observational study	146
2020	Qin et al. [7]	Anti-PD-1	Camrelizumab	Hepatocellular carcinoma	Single-arm study	220
2020	Huang et al. [8]	Anti-PD-1	Camrelizumab	Esophageal squamous cell carcinoma	Randomized controlled study	457
2020	Liu et al. [9]	Anti-PD-1	Camrelizumab	Breast cancer	Single-arm study	50
2020	Yuan et al. [10]	Anti-PD-1	Camrelizumab	Hepatocellular carcinoma	Observational study	63
2021	Wang et al. [11]	Anti-PD-1	Camrelizumab	Hodgkin lymphoma	Single-arm study	50
2021	Liu et al. [12]	Anti-PD-1	Camrelizumab	Hodgkin lymphoma	Single-arm study	61
2021	Mei et al. [13]	Anti-PD-1	Camrelizumab	Liver cancer	Single-arm study	28
2021	Zhou et al. [14]	Anti-PD-1	Camrelizumab	Non-small cell lung cancer	Randomized controlled study	419
2021	Xu et al. [15]	Anti-PD-1	Camrelizumab	Hepatocellular carcinoma	Single-arm study	190
2022	Ren et al. [16]	Anti-PD-1	Camrelizumab	Non-small cell lung cancer	Randomized controlled study	390
2021	Zhang et al. [17]	Anti-PD-1	Camrelizumab	Esophageal squamous cell carcinoma	Single-arm study	20
2021	Luo et al. [18]	Anti-PD-1	Camrelizumab	Esophageal squamous cell carcinoma	Randomized controlled study	596
2021	Yang et al. [19]	Anti-PD-1	Camrelizumab	Nasopharyngeal carcinoma	Randomized controlled study	263
2021	Sun et al. [20]	Anti-PD-1	Camrelizumab	Gastric cancer	Single-arm study	6
2021	Lin et al. [21]	Anti-PD-1	Camrelizumab	Rectal cancer	Single-arm study	30
2021	Wang et al. [22]	Anti-PD-1	Camrelizumab	Biliary tract cancer	Single-arm study	22
2021	Jiang et al. [23]	Anti-PD-1	Camrelizumab	Colorectal cancer	Observational study	16
2021	Wei et al. [24]	Anti-PD-1	Camrelizumab	Hepatocellular carcinoma	Observational study	48
2021	Yu et al. [25]	Anti-PD-1	Camrelizumab	Biliary tract cancers	Single-arm study	14
2021	Zhou et al. [26]	Anti-PD-1	Camrelizumab	Colorectal cancer	Observational study	25
2022	Yang et al. [27]	Anti-PD-1	Camrelizumab	Non-small cell lung cancer	Single-arm study	146
2022	Wu et al. [28]	Anti-PD-1	Camrelizumab	Hodgkin lymphoma	Single-arm study	101
2022	Xia et al. [29]	Anti-PD-1	Camrelizumab	Ovarian cancer	Single-arm study	37
2020	Papadopoulos et al. [30]	Anti-PD-1	Cemiplimab	Advance solid cancer	Single-arm study	60
2020	Rischin et al. [31]	Anti-PD-1	Cemiplimab	Cutaneous squamous cell carcinoma	Single-arm study	115
2020	Migden et al. [32]	Anti-PD-1	Cemiplimab	Cutaneous squamous cell carcinoma	Single-arm study	78
2021	Kitano et al. [33]	Anti-PD-1	Cemiplimab	Advanced malignancies	Single-arm study	13
2020	Rischin et al. [34]	Anti-PD-1	Cemiplimab	Cervical cancer	Single-arm study	20
2021	Sezer et al. [35]	Anti-PD-1	Cemiplimab	Non-small cell lung cancer	Randomized controlled study	710
2021	Stratigos et al. [36]	Anti-PD-1	Cemiplimab	Basal cell carcinoma	Single-arm study	84
2021	Baggi et al. [37]	Anti-PD-1	Cemiplimab	Cutaneous squamous cell carcinoma	Observational study	131

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2021	Hober et al. [38]	Anti-PD-1	Cemiplimab	Cutaneous squamous cell carcinoma	Observational study	245
2021	Valentin et al. [39]	Anti-PD-1	Cemiplimab	Cutaneous squamous cell carcinoma	Observational study	22
2022	Gogishvili et al. [40]	Anti-PD-1	Cemiplimab	Non-small cell lung cancer	Randomized controlled study	466
2022	Tewari et al. [41]	Anti-PD-1	Cemiplimab	Cervical cancer	Randomized controlled study	608
2022	Lu et al. [42]	Anti-PD-1	Sintilimab	Non-small cell lung cancer	Randomized controlled study	444
2019	Shi et al. [43]	Anti-PD-1	Sintilimab	Hodgkin lymphoma	Single-arm study	96
2020	Jiang et al. [44]	Anti-PD-1	Sintilimab	Gastric/gastroesophageal	Single-arm study	20
2020	Gao et al. [45]	Anti-PD-1	Sintilimab	Non-small cell lung cancer	Single-arm study	40
2021	Jiang et al. [46]	Anti-PD-1	Sintilimab	Advance solid cancer	Single-arm study	207
2021	Jiang et al. [47]	Anti-PD-1	Sintilimab	Non-small cell lung cancer	Single-arm study	41
2021	Tao et al. [48]	Anti-PD-1	Sintilimab	Extranodal NK/T-cell lymphoma	Single-arm study	28
2021	Ni et al. [49]	Anti-PD-1	Sintilimab	Non-small cell lung cancer	Single-arm study	20
2021	Duan et al. [50]	Anti-PD-1	Sintilimab	Esophageal cancer	Single-arm study	23
2021	Lu et al. [51]	Anti-PD-1	Sintilimab	Renal cell carcinoma	Observational study	17
2022	Huang et al. [52]	Anti-PD-1	Sintilimab	Malignant tumor	Observational study	48
2022	Xu et al. [53]	Anti-PD-1	Sintilimab	Esophageal squamous cell carcinoma	Randomized controlled study	190
2022	Shi et al. [54]	Anti-PD-1	Sintilimab	Squamous non-small cell lung cancer	Randomized controlled study	290
2022	Lu et al. [55]	Anti-PD-1	Sintilimab	Esophageal squamous cell carcinoma	Randomized controlled study	659
2020	Naing et al. [56]	Anti-PD-1	Spartalizumab	Solid tumor	Single-arm study	58
2021	Minami et al. [57]	Anti-PD-1	Spartalizumab	Solid tumor	Single-arm study	18
2021	Yao et al. [58]	Anti-PD-1	Spartalizumab	Neuroendocrine tumor	Single-arm study	116
2019	Wang et al. [59]	Anti-PD-1	Toripalimab	Gastric cancer	Single-arm study	58
2020	Yang et al. [60]	Anti-PD-1	Toripalimab	Solid tumor	Single-arm study	33
2020	Wei et al. [61]	Anti-PD-1	Toripalimab	Malignant solid tumor	Single-arm study	25
2020	Lu et al. [62]	Anti-PD-1	Toripalimab	Neuroendocrine tumor	Single-arm study	40
2020	Wang et al. [63]	Anti-PD-1	Toripalimab	Non-small cell lung cancer	Single-arm study	41
2020	Tang et al. [64]	Anti-PD-1	Toripalimab	Melanoma	Single-arm study	127
2021	Wang et al. [65]	Anti-PD-1	Toripalimab	Nasopharyngeal carcinoma	Single-arm study	190
2021	Hua et al. [66]	Anti-PD-1	Toripalimab	Nasopharyngeal carcinoma	Single-arm study	25
2022	Lian et al. [67]	Anti-PD-1	Toripalimab	Multiple myeloma	Single-arm study	145
2022	Hu et al. [68]	Anti-PD-1	Toripalimab	Colon cancer	Single-arm study	17
2022	Wang et al. [69]	Anti-PD-1	Toripalimab	Esophageal squamous cell carcinoma	Randomized controlled study	514
2017	Peters et al. [70]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Single-arm study	659
2017	Balar et al. [71]	Anti-PD-L1	Atezolizumab	Urinary tract carcinoma	Single-arm study	119
2018	Petrylak et al. [72]	Anti-PD-L1	Atezolizumab	Urinary tract carcinoma	Single-arm study	95
2018	Fehrenbacher et al. [73]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Randomized controlled study	2,075

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2018	Socinski et al. [74]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Randomized controlled study	800
2018	Pal et al. [75]	Anti-PD-L1	Atezolizumab	Urinary tract carcinoma	Single-arm study	218
2019	Adams et al. [76]	Anti-PD-L1	Atezolizumab	Breast cancer (metastatic triple-negative)	Single-arm study	33
2019	West et al. [77]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Randomized controlled study	723
2019	Pujol et al. [78]	Anti-PD-L1	Atezolizumab	Small cell lung cancer	Randomized controlled study	73
2020	Ikeda et al. [79]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Single-arm study	17
2020	Jotte et al. [80]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Randomized controlled study	1,021
2020	Herbst et al. [81]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Randomized controlled study	554
2020	Lin et al. [82]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Single-arm study	40
2020	Shu et al. [83]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Single-arm study	30
2020	Galsky et al. [84]	Anti-PD-L1	Atezolizumab	Urinary tract carcinoma	Randomized controlled study	1,213
2020	Emens et al. [85]	Anti-PD-L1	Atezolizumab	Breast cancer (HER2-positive advanced)	Randomized controlled study	202
2020	Loriot et al. [86]	Anti-PD-L1	Atezolizumab	Urinary tract carcinoma	Single-arm study	997
2020	Mittendorf et al. [87]	Anti-PD-L1	Atezolizumab	Breast cancer (TNBC)	Randomized controlled study	333
2021	van der Heijden et al. [88]	Anti-PD-L1	Atezolizumab	Urothelial carcinoma	Randomized controlled study	902
2021	Emens et al. [89]	Anti-PD-L1	Atezolizumab	Breast cancer (triple-negative)	Randomized controlled study	902
2021	Bellmunt et al. [90]	Anti-PD-L1	Atezolizumab	Urinary tract carcinoma	Randomized controlled study	809
2021	Felip et al. [91]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Randomized controlled study	1,005
2021	Nishio et al. [92]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Randomized controlled study	578
2021	Szabados et al. [93]	Anti-PD-L1	Atezolizumab	Bladder cancer	Single-arm study	95
2021	Moore et al. [94]	Anti-PD-L1	Atezolizumab	Ovarian cancer	Randomized controlled study	1,301
2021	van den Ende et al. [95]	Anti-PD-L1	Atezolizumab	Esophageal adenocarcinoma	Single-arm study	40
2021	Miles et al. [96]	Anti-PD-L1	Atezolizumab	Breast cancer (TNBC)	Randomized controlled study	651
2021	de Azevedo et al. [97]	Anti-PD-L1	Atezolizumab	Melanoma	Single-arm study	52
2021	Ardizzoni et al. [98]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Single-arm study	615
2021	Furuya et al. [99]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Observational study	152
2021	Liu et al. [100]	Anti-PD-L1	Atezolizumab	Small cell lung cancer	Randomized controlled study	403
2022	Gianni et al. [101]	Anti-PD-L1	Atezolizumab	Breast cancer (triple-negative)	Randomized controlled study	280
2022	Tabernero et al. [102]	Anti-PD-L1	Atezolizumab	Colorectal cancer	Randomized controlled study	445
2022	Kenmotsu et al. [103]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Randomized controlled study	990
2022	Mettu et al. [104]	Anti-PD-L1	Atezolizumab	Colorectal cancer	Randomized controlled study	133
2022	Pal et al. [105]	Anti-PD-L1	Atezolizumab	Renal cell carcinoma	Randomized controlled study	778
2022	Rossevold et al. [106]	Anti-PD-L1	Atezolizumab	Breast cancer (TNBC)	Randomized controlled study	68
2022	Peters et al. [107]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer	Randomized controlled study	471
2022	Huober et al. [108]	Anti-PD-L1	Atezolizumab	Breast cancer	Randomized controlled study	454
2016	Mizugaki et al. [109]	Anti-PD-L1	Atezolizumab	Non-small cell lung cancer, mel- anoma, pancreatic cancer, and thymic cancer	Single-arm study	6
2017	Heery et al. [110]	Anti-PD-L1	Avelumab	Solid tumor	Single-arm study	53
2018	Dirix et al. [111]	Anti-PD-L1	Avelumab	Breast cancer	Single-arm study	168

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2019	Chung et al. [112]	Anti-PD-L1	Avelumab	Gastric/gastroesphageal cancer	Single-arm study	90
2019	Disis et al. [113]	Anti-PD-L1	Avelumab	Ovarian cancer	Single-arm study	125
2019	Hassan et al. [114]	Anti-PD-L1	Avelumab	Mesothelioma	Single-arm study	53
2019	Keilholz et al. [115]	Anti-PD-L1	Avelumab	Melanoma	Single-arm study	51
2019	Vaishampayan et al. [116]	Anti-PD-L1	Avelumab	Renal cell carcinoma	Single-arm study	62
2019	Doi et al. [117]	Anti-PD-L1	Avelumab	Solid tumor	Single-arm study	40
2019	Konstantinopoulos et al. [118]	Anti-PD-L1	Avelumab	Endometrial cancer	Single-arm study	31
2020	Apolo et al. [119]	Anti-PD-L1	Avelumab	Urothelial carcinoma	Single-arm study	249
2020	Verschraegen et al. [120]	Anti-PD-L1	Avelumab	Non-small cell lung cancer	Single-arm study	156
2020	You et al. [121]	Anti-PD-L1	Avelumab	Gestational trophoblastic tumor	Single-arm study	15
2020	Kim et al. [122]	Anti-PD-L1	Avelumab	Colorectal cancer	Single-arm study	33
2020	Levy et al. [123]	Anti-PD-L1	Avelumab	Merkel cell carcinoma	Observational study	54
2021	Guigay et al. [124]	Anti-PD-L1	Avelumab	Head and neck cancer	Single-arm study	153
2021	Ascierto et al. [125]	Anti-PD-L1	Avelumab	Merkel cell carcinoma	Single-arm study	367
2021	D'Angelo et al. [126]	Anti-PD-L1	Avelumab	Merkel cell carcinoma	Single-arm study	116
2021	Park et al. [127]	Anti-PD-L1	Avelumab	Non-small cell lung cancer	Randomized controlled study	792
2021	Pujade-Lauraine et al. [128]	Anti-PD-L1	Avelumab	Ovarian cancer	Randomized controlled study	566
2021	Moehler et al. [129]	Anti-PD-L1	Avelumab	Gastric cancer	Randomized controlled study	499
2021	Monk et al. [130]	Anti-PD-L1	Avelumab	Ovarian cancer	Randomized controlled study	998
2021	Lee et al. [131]	Anti-PD-L1	Avelumab	Head and neck cancer	Randomized controlled study	697
2021	Lee et al. [132]	Anti-PD-L1	Avelumab	Hepatocellular carcinoma	Single-arm study	30
2021	Cowey et al. [133]	Anti-PD-L1	Avelumab	Merkel cell carcinoma	Observational study	28
2022	Tomita et al. [134]	Anti-PD-L1	Avelumab	Urothelial carcinoma	Randomized controlled study	700
2022	Zeidan et al. [135]	Anti-PD-L1	Durvaumab	Myelodysplastic syndromes	Randomized controlled study	84
2017	Powles et al. [136]	Anti-PD-L1	Durvalumab	Urothelial carcinoma	Single-arm study	191
2017	Antonia et al. [137]	Anti-PD-L1	Durvalumab	Non-small cell lung cancer	Randomized controlled study	476
2018	Garassino et al. [138]	Anti-PD-L1	Durvaumab	Non-small cell lung cancer	Single-arm study	111
2019	Siu et al. [139]	Anti-PD-L1	Durvalumab	Head and neck squamous cell carcinoma	Single-arm study	67
2019	Segal et al. [140]	Anti-PD-L1	Durvalumab	Head and neck squamous cell carcinoma	Single-arm study	62
2019	Fujiwara et al. [141]	Anti-PD-L1	Durvaumab	Solid tumor	Single-arm study	1
2019	Zandberg et al. [142]	Anti-PD-L1	Durvalumab	Head and neck squamous cell carcinoma	Single-arm study	112
2019	O'Reilly et al. [143]	Anti-PD-L1	Durvalumab	Pancreatic ductal adenocarcinoma	Single-arm study	33
2020	Kelly et al. [144]	Anti-PD-L1	Durvaumab	Gastric and gastroesophageal junction adenocarcinoma	Single-arm study	88
2020	Ferris et al. [145]	Anti-PD-L1	Durvalumab	Head and neck squamous cell carcinoma	Randomized controlled study	489
2020	Ferrarotto et al. [146]	Anti-PD-L1	Durvalumab	Oropharyngeal squamous cell carcinoma	Single-arm study	29
2021	Kelley et al. [147]	Anti-PD-L1	Durvaumab		Single-arm study	104

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2021	Altorki et al. [148]	Anti-PD-L1	Durvalumab	Non-small cell lung cancer	Randomized controlled study	30
2021	Antill et al. [149]	Anti-PD-L1	Durvalumab	Endometrial cancer	Single-arm study	36
2021	Goldman et al. [150]	Anti-PD-L1	Durvaumab	Small cell lung cancer	Randomized controlled study	537
2022	Park et al. [151]	Anti-PD-L1	Durvalumab	Esophageal squamous cell carcionoma	Randomized controlled study	86
2022	Sonpavde et al. [152]	Anti-PD-L1	Durvalumab	Urothelial carcinoma	Single-arm study	867
2022	Park et al. [153]	Anti-PD-L1	Durvaumab	Small cell lung cancer	Single-arm study	50
2020	Rizvi et al. [154]	Anti-PD-L1	Durvalumab	Non-small cell lung cancer	Randomized controlled study	746
2020	Powles et al. [155]	Anti-PD-L1	Durvalumab	Urothelial carcinoma	Randomized controlled study	690
2023	Rosenberg et al. [156]	Anti-PD-L1	Durvaumab	Urothelial carcinoma	Single-arm study	76
2021	Borghaei et al. [157]	Anti-PD-L1	Durvalumab	Non-small cell lung cancer	Single-arm study	68
2022	Herbst et al. [158]	Anti-PD-L1	Durvalumab	Non-small cell lung cancer	Single-arm study	189
2009	Camacho et al. [159]	Anti-CTLA-4	Tremelimumab	Melanoma	Single-arm study	89
2010	Kirkwood et al. [160]	Anti-CTLA-4	Tremelimumab	Melanoma	Single-arm study	251
2013	Ribas et al. [161]	Anti-CTLA-4	Tremelimumab	Melanoma	Randomized controlled study	655
2015	Joshua et al. [162]	Anti-CTLA-4	Tremelimumab	Melanoma	Single-arm study	11
2017	Maio et al. [163]	Anti-CTLA-4	Tremelimumab	Mesothelioma	Randomized controlled study	571
2017	Duffy et al. [164]	Anti-CTLA-4	Tremelimumab	Hepatocellular carcinoma	Single-arm study	32
2020	Sharma et al. [165]	Anti-CTLA-4	Tremelimumab	Urothelial carcinoma	Single-arm study	32
2010	Chung et al. [166]	Anti-CTLA-4	Tremelimumab	Colorectal cancer	Single-arm study	47
2021	Campbell et al. [167]	Anti-CTLA-4	Tremelimumab	Renal cell carcinoma	Single-arm study	29
2021	Edenfield et al. [168]	Combination	Durvalumab and tremelimumab	Rare cancers	Single-arm study	50
2020	Pakkala et al. [169]	Combination	Durvalumab and tremelimumab	Small cell lung cancer	Single-arm study	9
2020	Juergens et al. [170]	Combination	Durvalumab and tremelimumab	Solid tumor	Single-arm study	136
2021	Segal et al. [171]	Combination	Durvalumab and tremelimumab	Colorectal cancer	Single-arm study	24
2021	Sarfaty et al. [172]	Combination	Durvalumab and tremelimumab	Non-urothelial carcinoma of the urinary tract	Single-arm study	13
2020	Kim et al. [173]	Combination	Durvalumab and tremelimumab	Pulmonary sarcomatoid carcinoma	Single-arm study	18
2021	Leighl et al. [174]	Combination	Durvalumab and tremelimumab	Non-small cell lung cancer	Single-arm study	58
2022	Schoenfeld et al. [175]	Combination	Durvalumab and tremelimumab	Non-small cell lung cancer	Single-arm study	90
2023	de Castro Jr et al. [176]	Combination	Durvalumab and tremelimumab	Non-small cell lung cancer	Randomized controlled study	823
2022	Leighl et al. [177]	Combination	Durvalumab and tremelimumab	Non-small cell lung cancer	Single-arm study	150

ICI, immune checkpoint inhibitor; PD-1, programmed cell death protein-1; NK, natural killer cell; PD-L1, programmed death-ligand 1; HER2, human epidermal growth factor receptor 2; TNBC, triple negative breast cancer; CTLA-4, cytotoxic T lymphocyte-associated antigen 4.