

Table 1. Mechanistic analysis of lncRNA involved in GC metastasis and clinical correlations

| Inc RNA ID | Dysregulation | Upstream regulators | Downstream targets | Metastasis processes | Clinical correlation | Univariate analysis(HR 95%CI) P<0.05 | | Multivariate analysis(HR 95%CI) P<0.05 | | Reference |
|------------|---------------|---------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------------------|--------------------------------------|-----------------|----------------------------------------|-----|------------------|
| | | | | | | OS | DFS | OS | DFS | |
| MALAT1 | up | JMJD1A | UPF1, Snail, N-cadherin, ZEB1, VE-cadherin / β -catenin complex, ERK/MMP, FAK/paxillin, EGFL7, miR122 | EMT, Angiopoiesis, VM | Lymphatic metastasis, distant metastasis, TNM stage | 1.38(1.03-1.85) | 1.40(1.01-1.94) | | | [14,17,23,86,87] |
| HOTAIR | up | | PCR2, miR34a, c-MET, SNAIL1, CDH1, miR-152, HLA-G | EMT, immune escape | Lymphatic metastasis, distant metastasis, TNM stage | | | | | [74-76,78,88-90] |
| FRLnC | up | FOXM1 | Twist,TGF β -1 | EMT | | | | | | [25] |
| UCA1 | up | | TGF β -1, GRK2/ERK/MMP9 | EMT, degradation of the ECM | Lymphatic metastasis, TNM stage | 3.909(1.592-9.599) | | 2.917(1.069-7.962) | | [30,74] |
| ATB | up | TGF β -1 | miR200s, ZEB1 | EMT | | | | 3.50(1.73-7.44) | | [26] |
| XIST | up | | miR101 | EMT | Lymphatic metastasis, distant | | | | | [27] |

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|------------|------|---------------------------------------|----------------------------------|---------------------------------------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|---------|
| | | | | metastasis, TNM stage | | | | | |
| SNHG-6 | up | miR101-3P, ZEB1 | EMT | Lymphatic metastasis, distant metastasis, TNM stage | | | | | [28] |
| ZFAS1 | up | ZEB1,SNAIL , Slug, Twist | EMT | Lymphatic metastasis, TNM stage | | | | | [29] |
| LINC00152 | up | | EMT | Lymphatic metastasis, TNM stage | 2.162(1. 327-3.5 24) | | 1.659(1. 008-2.7 31) | | [91] |
| HULC | up | | EMT | Lymphatic metastasis, distant metastasis, TNM stage | | | | | [35] |
| Linc00978 | up | TGFβ/SMA D, Twist1, Slug | EMT | Lymphatic metastasis, TNM stage | | | | | [32] |
| YAP1 | up | vimentin, β-catenin, E-cadherin | EMT | Lymphatic metastasis, distant metastasis, TNM stage | | | | | [33] |
| Linc00261 | down | Slug, GSK3β | EMT | Lymphatic, metastasis | | 0.494(0. 300-0.8 12) | | 0.551(0. 323-0.9 40) | [36] |
| Linc00675 | down | vimentin | EMT | | | | | | [40] |
| SPRY4-I T1 | down | vimentin | EMT, epigenetic regulation | Lymphatic metastasis, distant metastasis, TNM stage | 1.247(1 473-1.9 96) | 2.223(1. 806-2.5 9) | 0.818(0. 314-1.5 67) | 1.741(1. 324-247 7) | [43,92] |

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| LEIGC | down | | | EMT | | | | | | [44] |
| GClnc1 | up | | WDR5/KAT2, H3K4,H3K9, SOD2 | epigenetic regulation | | 2.21(1.4 6-3.33) | | 1.93(1.2 4-3.00) | | [15] |
| LOC100130476 | down | DNMT1 | | epigenetic regulation | Lymphatic metastasis, distant metastasis, TNM stage | | | | | [47] |
| AK058003 | up | | SNCG | epigenetic regulation, hypoxia | Lymphatic metastasis, TNM stage | | | | | [57] |
| BC005927 | up | HIF-1α | BPHB4 | hypoxia | Lymphatic metastasis, TNM stage | | | | | [58] |
| SNHG15 | up | | MMP2,MMP9 | degradation of the ECM | Lymphatic metastasis, TNM stage | | | | | [93] |
| FENDRR | down | | MMP2,MMP9 | degradation of the ECM | Lymphatic metastasis | 0.539(0.337-0.862) | 0.563(0.370-0.856) | 0.569(0.321-0.960) | 0.555(0.344-0.897) | [16] |
| BM742401 | down | | MMP9 | degradation of the ECM | | | | | | [53] |
| C21orf96 | up | | | Lymphangiogenesis, VM | Lymphatic metastasis, distant metastasis | | | | | [69] |
| LINC00052 | up | | Wnt/β-catenin pathway | | TNM stage | | | | | |
| AA174084 | down | | | | | | | | | [81] |
| RMRP | down | | | | Lymphatic metastasis | | | | | [82] |

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| SNHG1 | up | | Lymphatic metastasis, TNM stage | [94] |
| SNHG5 | down | | TNM stage | [95] |
| MSTO2 P | up | miR-335 | Lymphatic metastasis, distant metastasis | [96] |
| ZEB1-A S1 | up | miR-335-5p | Lymphatic metastasis, TNM stage | [97] |
| PTENP1 | down | miR-106b, miR-93 | Lymphatic metastasis, TNM stage | |
| RP11-19 P22.6-00 1 | down | nitric oxide synthase 2 (NOS2) | Lymphatic metastasis, TNM stage | |
| PCAT-1 | up | | distant metastasis | [98] |
| HOXD-ASI | up | | Lymphatic metastasis, distant metastasis, TNM stage | [99] |
| CARLo-5 | up | | Lymphatic metastasis, distant metastasis | [100] |
| LINC00673 | down | | Lymphatic metastasis | [101] |
| LINC00982 | down | | Lymphatic metastasis, TNM stage | [102] |
| HMlinc RNA717 | down | | distant metastasis | [103] |

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| PVT1 | up | | | Lymphatic metastasis | | | | | [104] |
| GACAT3 | up | IL-6/STAT3 | | distant metastasis, TNM stage | | | | | [105] |
| Sox2ot | down | | | distant metastasis | 3.241(1.239-6.428) | | 3.844(1.873-7.332) | | [106] |
| HOTTIP | up | HOXA13 | | Lymphatic metastasis, TNM stage | | | | | [107] |
| NEAT1 | up | | | Lymphatic metastasis, distant metastasis | | | | | [108,109] |
| OTUB1-i soform2 | up | N-cadherin, MMP2,MMP9, E-cadherin | | Lymphatic metastasis, TNM stage | 1,538(1.044-2.265) | 1.615(1.111-2.348) | 1.498(1.021-2.200) | | [110] |
| PANDAR | | | | Lymphatic metastasis, TNM stage | 4.612(1.59-13.825) | 3.113(1.591-6.093) | 3.683(1.125-12.058) | 2.359(1.153-4.830) | [111] |
| ZMAT1 transcript variant 2 | down | | | Lymphatic metastasis, distant metastasis, TNM stage | | | | | [112] |
| JMJD1A | up | MALAT1,MAPK | | Lymphatic metastasis, TNM stage | 8.446(4.480-15.923) | | 3.988(1.948-8.167) | | [113] |
| OR3A4 | up | PDLIM2, MACC1,NTN4, GNB2L1 | degradation of the ECM, angiopoiesis, VM | Lymphatic metastasis, distant metastasis | | | | | [54] |
| HNF1A- | down | | | Lymphatic | | | | | [114] |

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|-------------|------|-----------------------------------------------------|--------------------|--------------------|--------------------|------------------------------|--|
| AS1 | | metastasis | | | | | |
| BANCR | up | Lymphatic metastasis, distant metastasis | 2.457(1.715-3.521) | 1.511(1.02-2.227) | [115] | | |
| DQ786243 | up | Lymphatic metastasis, TNM stage | [116] | | | | |
| XLOC_010235 | up | distant metastasis, TNM stage | [117] | | | | |
| CCAT2 | up | Lymphatic metastasis, distant metastasis, TNM stage | 2.631(1.348-5.672) | 2.574(1.201-5.476) | 2.405(1.194-5.417) | 2.315(1.097-5.283) [118,119] | |
| Linc-UBC1 | up | Lymphatic metastasis, TNM stage | [120] | | | | |
| HIF1A-AS2 | up | Lymphatic metastasis, TNM stage | 2.346(1.379-3.991) | 1.724(1.002-2.964) | [121] | | |
| LET | down | Lymphatic metastasis, distant metastasis, TNM stage | 2.513(1.414-5.847) | 2.275(1.301-5.176) | [122] | | |
| LSINCT5 | up | Lymphatic metastasis, TNM stage | 2.501(1.326-4.719) | 1.081(1.286-3.564) | [123] | | |
| AC130710 | up | distant metastasis, TNM stage | [124] | | | | |
| FER1L4 | down | Lymphatic metastasis, | [125] | | | | |

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|--------------------|------|---------|--|-----------------------------------------------------------------|----------------------------|-----------------------------------------|
| | | | | distant metastasis, TNM stage | | |
| RuPAR | down | | | Lymphatic metastasis, distant metastasis, TNM stage | [126] | |
| H19 | up | miR-675 | | Lymphatic metastasis, TNM stage | 1.170(1. 050-1.3 04) | 1.137(1. 005-1.2 87) [127,128] |
| AC09665 5.1-002 | down | | | Lymphatic metastasis, distant metastasis, TNM stage | [129] | |
| SUMO1 P3 | up | | | Lymphatic metastasis | [130] | |
| IGF2 | up | | | Lymphatic metastasis | [131] | |
| CCAT1 | up | | | Lymphatic metastasis, TNM stage | [132] | |