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Esophageal adenocarcinoma and squamous cell carcinoma in children and adolescents: Report of 3 cases and comprehensive literature review

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ABSTRACT

Malignant esophageal tumors are exceedingly rare in children and adolescents. We present 3 cases of esophageal adenocarcinoma (AC) and squamous cell carcinoma (SSC) in patients ≤21 years of age who were treated at our institution between 1950 and 2015. We also undertook an analysis of those cases, combined with cases from a review of the literature, to examine patient demographics, disease characteristics, and outcomes. We identified one patient with AC and two patients with SCC treated at our institution, as well as 19 cases of AC (median age 16) and 23 cases of SCC (median age 15) reported in the literature. Male predominance was noted at a ratio of 2.2 to 1. Dysphagia, weight loss, and anemia were the most common presenting symptoms for both entities. Approximately 84% of AC tumors were located in the distal esophagus and gastroesophageal junction whereas SCC tumors were distributed evenly throughout esophagus. Metastatic disease at presentation was found in 68.4% of patients with AC compared to 30.4% of those with SCC. Survival was not significantly different between SCC and AC ($P = 0.36$), between genders ($P = 0.13$), and between patients treated with surgery vs. multimodality therapy ($P = 0.15$). Metastasis, however, predicted worse outcome ($P = 0.0019$). We found that adolescent AC and SCC show characteristics similar to such tumors when presenting in adults. Though extremely rare in the adolescent population, these malignant diseases should always be ruled out when young patients present with a short history of dysphagia with signs of clinical deterioration.

Malignant esophageal tumors are the sixth leading cause of death from cancer worldwide [1], with a peak prevalence between 35 and 64 years of age [1]. The presentation of an esophageal tumor in children and adolescents is an exceedingly rare event. Between 1973 and 2008, the Surveillance, Epidemiology, and End Results (SEER) program identified only nine malignant esophageal tumors in patients under age 20 [2]. The largest series was presented by Kumar et al., in 1992 with four cases of squamous cell carcinoma (SCC) and three of adenocarcinoma (AC) with the oldest patient being 19 years of age [3]. With the report of three new cases of our own and an extensive literature review, we aim to contribute to the general understanding of these rare childhood tumors.

1. Patients and methods

The review was conducted under an Institutional Review Board waiver in accordance with the Health Insurance Portability and Accountability Act regulations. All patients 21 years and younger with AC and SCC treated in our institution between 1950 and 2015 were reviewed. Histopathology diagnosis was confirmed by the pathology service of our institution.

The international literature was reviewed for reports on malignant tumors of the esophagus in patients under the age of 21 years using the U.S. National Library of Medicine (www.pubmed.gov). Search terms used: cancer, adenocarcinoma, squamous cell carcinoma, esophagus, and children, childhood, child, pediatrics. Publications in languages other than English were professionally translated.

All cases of AC and SSC identified at our institution and in the literature were analyzed for age at presentation, gender, presenting

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Table 1
Patients under the age of 21 with esophageal adenocarcinoma and squamous cell carcinoma treated at our institution.

Case no.	Year	Histology	Age/sex	Esophageal location	Histologic differentiation	Presenting symptoms (duration)	Metastasis	Therapy	Follow-up period (months)	Follow-up status
1	1985	SCC	18/M	Middle third	Not noted	Dysphagia, weight loss, retrosternal pain (1 month)	Lung, visceral + parietal pleura, liver, diaphragm, lymph nodes (mediastinal, peripancreatic, peri-aortic, coeliac)	Palliative laser therapy, feeding gastrostomy[a]	11	DOD
2	1993	AC	21/M	Distal third	Poor	Dysphagia, regurgitation (1 month)	Liver, bone (vertebral body (L2), 2nd rib), brain (frontal epi-dura), lymph nodes (mediastinal, peri-aortic, para caval, mesenteric, left renal hilum)	Chemotherapy,[b] later palliative radiotherapy to the brain and spine[c]	2.2	DOD
3	2004	SCC	21/F	Middle third	Moderate	Dysphagia, weight loss, odynophagia, retrosternal pain (4 months)	None	Neo-adjuvant chemo- and radiotherapy,[d,e] Ivor Lewis esophagectomy (R0), esophagogastrostomy	64	NED

M = male, F = female, DOD = died of disease, NED = no evidence of disease, R0 = margin of resection free of disease.
[a] Chemo- and radiotherapy at outside hospital (unknown agents and dosage).
[b] VP-16, cisplatin.
[c] 3000 cGy to lumbar spine (10 fractions), 1500 cGy to whole brain (5 fractions).
[d] Irinotecan, platinum (over 3 weeks), changed to taxol, 5-fluorouracil (over 5 weeks).
[e] 5040 cGy (28 fractions).

symptoms, preexisting conditions, tumor histology, tumor location, tumor differentiation, metastatic disease, treatment, and outcome. Only reports with complete information on the histopathology subtype of the tumor were included in later analysis. Survival was analyzed using the Kaplan-Meier method, and the log-rank test was used.

2. Results

We identified one patient with AC and two patients with SCC of the esophagus treated at our institution. One 21-year-old male presented with a poorly differentiated AC of the distal esophagus. No Barrett's esophagus was reported in the endoscopy histologic report sections of the endoscopy or in the previous history. He died 2.2 months after chemotherapy with liver, vertebral, brain and lymph node metastasis (Table 1). An 18-year-old male was treated with palliative therapy for late stage SCC of the mid-esophagus with metastasis to lung, liver, diaphragm and lymph nodes. He died 11 months after first presentation. The other patient with a

Table 2
Patient characteristics of esophageal adenocarcinoma and squamous cell carcinoma in patients 21 years and younger.

	AC	SSC	Overall
Number of cases			
Absolute (percent)	19 (45.2%)	23 (54.8%)	42 (100%)
Median age			
Years (range)	16 (8–21)	15 (8–21)	15 (8–21)
Sex distribution			
Male: Female	5.3: 1	1.3: 1	2.2: 1
Presenting symptoms			
Dysphagia	15 (78.9%)	20 (87.0%)	35 (83.3%)
Weight loss	9 (47.4%)	14 (60.9%)	23 (54.8%)
Anemia	6 (31.6%)	8 (34.8%)	14 (33.3%)
Dehydration	4 (21.1%)	5 (21.7%)	9 (21.4%)
Nausea	3 (15.8%)	5 (21.7%)	8 (19.0%)
Epigastric or retrosternal pain/burning	2 (10.5%)	4 (17.4%)	6 (14.3%)
Gastroesophageal reflux	5 (26.3%)	–	5 (11.9%)
Vomiting	3 (15.8%)	2 (8.7%)	5 (11.9%)
Hematemesis	2 (10.5%)	–	2 (4.8%)
Recurrent pneumonia	–	1 (4.3%)	1 (2.4%)
Hematochezia	1 (5.3%)	–	1 (2.4%)
Constipation	1 (5.3%)	–	1 (2.4%)
Odynophagia	–	1 (4.3%)	1 (2.4%)
Other conditions			
Barrett's esophagus	6 (31.6%)	–	6 (14.3%)
Cigarette smoking	3 (10.5%)[a]	2 (8.7%)[c]	5 (11.9%)
Spinal palsy	3 (15.8%)[a]	–	3 (7.1%)
Caustic injury	–	3 (13.0%)[d]	3 (7.1%)
Previous surgery	1 (5.3%)[e]	1 (4.3%)[f]	2 (4.8%)
Previous cancer treatment	–	1 (4.3%)[g]	1 (2.4%)
Hiatal hernia	1 (5.3%)	1 (4.3%)[b]	2 (4.8%)
HP positive gastritis	1 (5.3%)	–	1 (2.4%)
Overweight	1 (5.3%)[h]	–	1 (2.4%)
Foreign body ingestion	1 (5.3%)[a]		1 (2.4%)
Esophageal HPV-16 infection	–	1 (4.3%)	1 (2.4%)
Factor VIII deficiency	1 (5.3%)[a]	–	1 (2.4%)
Polycystic kidney disease and vesicoureteral reflux IV°	–	1 (4.3%)[i,b]	1 (2.4%)
Goiter with hyperthyroidism	–	1 (4.3%)[b]	1 (2.4%)
None	7 (36.8%)	14 (60.9%)	21 (50.0%)

AC = Adenocarcinoma, SCC = Squamous cell carcinoma, HP = Helicobacter pylori, HPV-16 = Human papillomavirus 16.
[a] Patients with Barrett's esophagus within this group.
[b] Same patient.
[c] 3- and 5-year history of cigarette smoking.
[d] One case of lye ingestion and two cases of ingestion of an unknown agent.
[e] Esophageal atresia repair in infancy.
[f] Gastrostomy for trichobezoar removal.
[g] Surgery and chemotherapy for osteosarcoma.
[h] BMI = 26.7 kg/m^2.
[i] Chronic renal failure.

moderately differentiated SCC of the mid-esophagus was a 21-year-old female who received neoadjuvant chemo- and radiotherapy followed by an Ivor Lewis esophagectomy. She was still alive after a 64-month follow-up period without any signs of recurrent disease.

A total of 19 cases of AC [3–15] and 21 of SCC [3,15–26] in patients younger than 21 years were identified in the international literature (Appendices A and B). One of the patients with SCC was part of an epidemiologic study for which no specific patient data could be retrieved, and one AC case report was part of a journal's correspondence section with no further objective validation of histology [27,28]. These patients were excluded from our study. Including our own cases, we accumulated a total of 19 cases of AC and 23 cases of SCC for further analysis.

Table 2 presents characteristics of this patient cohort. The median age at presentation was 15 years (range, 8–21 years). The youngest patients to present with an AC and SCC were both 8 years old [10,20]. All other patients (40/42 patients [95.2%]) presented in the second decade of life. With respect to sex distribution by tumor entity, AC predominantly occurred in males (ratio, M:F = 5.3:1), whereas the incidence of SCC was almost evenly distributed between the sexes (ratio, M:F = 1.3:1).

In 18 of 42 reports (AC $n = 6$, SCC $n = 12$), the time to presentation after the onset of first symptoms was documented. Patients presented after a mean period of 3.1 months (±2.8 months) following onset of first symptoms. Presenting symptoms of all 42 patients are listed in Table 2. Dysphagia (35/42 patients [83.3%]), weight loss (23/42 patients [54.8%]), anemia (14/42 patients [33.3%]), dehydration (9/42 patients [21.4%]), and nausea (8/42 patients [19.0%]) were the leading presenting symptoms for both AC and SCC (Table 2).

In review of all reports on AC, authors reported other preexisting conditions prior to the onset of esophageal cancer in their patients. These were spinal palsy, tobacco use, esophageal atresia repair, hiatal hernia, overweight, previous foreign body ingestion, or Factor VIII deficiency. In 6 of 19 patients with AC (31.6%) the existence of Barrett's esophagus in areas surrounding the tumor was described [6,8,13] (Table 2). In the remaining 13 cases, no information was provided about the presence or absence of Barrett's esophagus.

Pre-existing conditions among patients with SCC included history of caustic injury, tobacco use, gastric surgery for trichobezoar removal, chemotherapy for osteosarcoma, esophageal HPV-16 infection, hiatal hernia, polycystic kidney disease, vesicoureteral reflux disease IV° with chronic renal failure, and goiter with hyperthyroidism (Table 2). In 3 patients, SCC after caustic injury (due to lye ingestion in one case and due to unknown agents in 2 cases) occurred after a latency of 1, 10 and 12 years, respectively, after ingestion [17,21,29].

In 15 of 19 (84.2%) patients, AC occurred in the distal esophagus and in the gastroesophageal junction (GEJ), whereas the cases of SCC showed an even distribution within the esophagus (Table 3). Recognizing that not all reports mentioned the histological differentiation, AC showed a higher tendency to be poorly differentiated compared to SSC (Table 3).

AC had a higher frequency of metastasis ($n = 13$ of 19 [68.4%]) compared to SCC ($n = 7$ of 23 [30.4%]). Lymph nodes were the most common metastatic site with positive nodes found along the esophagus, above the clavicle, along the aorta, the vena cava, at the celiac trunk, the lesser gastric curvature, and around the pancreas and the renal hilum. Only patients with AC developed brain and bone metastases (Table 3).

Survival was reported in 18 of 23 cases of SCC and in all 19 cases of AC. At the time of writing this report, 9 patients with SCC have died, either of disease ($n = 6$) or in relation to treatment ($n = 3$). Among 12 reported deaths among patients with AC, 11 were disease-related and 1 was treatment-related. Data on follow-up time and survival were provided for 12 SCC and 17 AC patients. For these patients the median survival time was 14 months for SCC and 9 months for AC (including patients with treatment-related deaths, Fig. 1). The overall survival between SCC and AC was not significantly different ($P = 0.3683$).

In the analysis of treatment strategies, we identified 6 patients (SCC $n = 1$, AC $n = 5$) treated with surgery plus chemotherapy. All of these patients were still alive compared to only 5 of 9 patients treated with surgery alone (SCC $n = 4$, AC $n = 5$).

Table 3
Tumor characteristics of esophageal adenocarcinoma and squamous cell carcinoma in patients 21 years and younger.

	AC, $n = 19$	SSC, $n = 23$	Overall, $n = 42$
Tumor location			
Proximal third	–	7 (30.4%)	7 (16.6%)
Middle third	4 (21.1%)	8 (34.8%)	12 (28.6%)
Distal third	9 (52.6%)	8 (34.8%)	17 (40.5%)
GE junction	6 (31.6%)	–	6 (14.3%)
Unknown	–	–	–
Tumor differentiation			
Well	2 (10.5%)	10 (43.5%)	12 (28.6%)
Moderate	2 (10.5%)	3 (13.0%)	5 (11.9%)
Poor	9 (52.6%)	2 (8.7%)	11 (26.2%)
Unknown	6 (31.6%)	8 (34.8%)	14 (33.3%)
Tumor dissemination			
No metastatic disease	4 (21.1%)	11 (47.8%)	15 (35.7%)
Metastatic disease	13 (68.4%)	7 (30.4%)	20 (47.6%)
Lymph nodes	9 (69.2%)	5 (71.4%)	14 (70.0%)
Lung/pleura	1 (7.7%)	3 (42.9%)	4 (20.0%)
Liver	4 (30.8%)	2 (8.7%)	6 (30.0%)
Brain/dura mater	2 (15.4%)	–	2 (10.0%)
Bone	1 (7.7%)	–	1 (5.0%)
Diaphragm	–	1 (14.2%)	1 (5.0%)
Unknown	2 (10.5%)	5 (21.7%)	7 (16.6%)

AC = Adenocarcinoma, SSC = Squamous Cell Carcinoma, GE = Gastroesophageal.

3. Discussion

Malignant esophageal tumors are extremely rare in children and adolescents. The majority of cases reported in the literature consist of SCC [3,15–27,30–32] and AC [3–15]. Other malignant esophageal tumors reported in the literature consist of synovial cell sarcoma [33–35], melanoma [36], and "lymphosarcoma" (presumably lymphoma, according to current classifications) [37]. At our institution we treated one patient with an AC and two patients with SCC.

Almost all patients presented during the second decade of life at a median age of 15 years (range, 8–21). The two patients younger

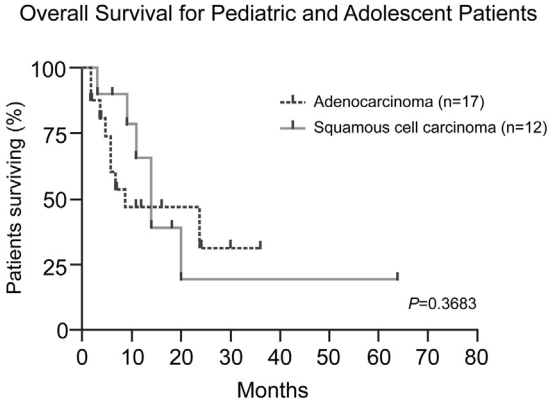

Fig. 1. Overall survival according to histology subtype. The median survival period was 9 months for adenocarcinoma (AC; $n = 17$) and 14 months for squamous cell carcinoma (SCC; $n = 12$) ($P = 0.3683$).

than age 10 showed no special characteristics other than the early onset of disease. In parallel to manifestation in adulthood, AC predominated among male patients (M:F = 5.3:1) and SCC were evenly distributed between the genders [38].

The time to presentation after onset of complaints was very short with an average of 3.1 months (±2.8 months). This interval is exceedingly shorter than the time to presentation of patients with benign esophageal lesions, which are often tolerated for many months and even years [39]. Dysphagia was the leading symptom followed by signs of clinical deterioration (weight loss, anemia, dehydration). However, benign esophageal lesions, such as leiomyomatosis, seem to present with respiratory symptoms, pain and vomiting [40].

Causes for the onset of esophageal malignancies in teenage years are yet undefined. In general, the same pathogenic factors for adult esophageal carcinogenesis are assumed to be true for the younger age group [25,41,42]. Among the reviewed patients with AC, 6 patients (31.6%) were diagnosed with Barrett's esophagus [6,8,13]. This number is likely to be higher since not all patients had been evaluated for this condition. Interestingly, about 63.2% of all AC patients had pre-existing conditions such as spinal palsy, hiatal hernia, esophageal atresia repair in infancy, history of foreign body ingestion, smoking, and obesity, all of which can be can be associated with gastroesophageal reflux disease (GERD), a risk factor for Barrett's esophagus [5,7,8,15].

Ingestion of caustic agents and history of smoking, two well-defined pathogenic factors for SCC, were only reported in five cases [13,17,21,29,32]. SCC developed 1, 10 and 12 years after caustic injury and after 3 and 5 years of cigarette smoking. Twenty patients (47.6%) developed metastasis. This rate is identical to that among adults, who also presented with metastatic disease in about 50% of cases [38].

In general, the failure to diagnose a malignant disease early is a known reason for poor prognosis. Including those patients identified in our literature search, data on follow-up time and survival were available for 17 patients with AC and 12 with SSC. For those patients, the median survival time was 9 months for AC and 14 months for SCC. Among adults with AC or SCC to the esophagus, the median survival time is reported to be between 13 and 19 months [38].

When young patients present with a (short) history of dysphagia a mediastinal process should be ruled out among other causes. Work-up should include blood examination, x-ray of the thorax, CT and/or MRI scan. Ultimately, biopsy is needed to define the histology if a mediastinal mass is present. Due to the rarity of esophageal cancer in children, treatment is based on principles used in adults. Complete surgical resection with wide margins and extended lymphadenectomy is the gold standard of surgical therapy. Some authors advocate the use of adjuvant chemotherapy leading to prolonged periods of remission among adults [38,43]. However, no common treatment strategies are established in children.

4. Conclusions

With the presentation of our three new cases of childhood esophageal cancer and a comprehensive review of the literature, we aim to contribute to the general understanding of this rare disease in the young. It is important for clinicians to consider a malignant esophageal process in children who present with a short history of dysphagia with signs of rapid deterioration including weight loss, dehydration, and anemia.

Potential and financial conflicts of interest

The authors have no potential and/or financial conflicts of interest.

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Appendix A. Table A

Esophageal adenocarcinoma in children and adolescents (<21 years of age) reported in the literature.

Author/year	Age/sex	Esophageal location (in thirds)	Histologic differentiation	Metastasis	Therapy	Follow-up period (months)	Follow-up status	Comments
Elliot, 1983	14/M	Distal	Moderate	Lymph node, bone	Esophagogastrectomy, esophagostomy	7	DOD	
Al Hilou, 1984	15/M	Middle	Poor	Lymph node	Palliative endo-esophageal stent	5	DOD	
Bright, 1986	20/M	Distal	Poor	Lymph node	Sub-total esophagectomy, esophagogastrostomy, adjuvant chemotherapy[a]	3	NED	Patient with factor VIII deficiency
Hoeffel, 1989	11/M	Distal	Not noted	Not noted	Esophagectomy	0	died	Died of aortic rupture
	14/M	Distal	Well	Liver	Distal 2/3rd esophagectomy, prox. gastrectomy	24	DOD	Late liver metastasis
Adzick, 1989	20/F	GEJ	Moderate	No	Distal esophagectomy, prox. gastrectomy, transverse colon interposition	12	NED	EA repair in infancy, tumor distal to site of EA repair
Kumar, 1992	19/M	Middle	Poor	Lung	Palliative presternal gastric pull-up	4	DOD	
	18/M	Middle	Well	Brain	Palliative radiotherapy	2	DOD	
	17/M	Distal	Poor	No	Partial esophagectomy esophagogastrostomy, adjuvant chemotherapy[b]	12	NED	
Hassall, 1993	17/M	Distal	Not noted	No	Total esophagectomy, gastric pull-up	36	NED	Patient with spastic quadriplegia
	15/M	Distal	Not noted	Liver	Not noted	not noted	DOD	Patient with cerebral palsy
	19/M	Distal	Not noted	Lymph node	Not noted	not noted	DOD	Patient with cerebral palsy
McGill, 1993	16/F	GEJ	Poor	Lymph node	Esophagogastrectomy and gastroesophagostomy, adjuvant chemotherapy[c]	30	NED	
Gangopadhyay, 1997	8/M	Middle	Not noted	Not noted	Therapy refused	6	DOD	
Sasaki, 1999	11/F	GEJ	Not noted	Lymph node	Endoscopic polypectomy, distal esophagectomy, proximal gastrectomy and jejunum interposition, chemotherapy[a]	11	NED	
Zotter, 2001	16/M	GEJ	Poor	No	Neo-adjuvant chemotherapy,[d] esophagogastrectomy, esophagojejunostomy	16	NED	
Radhika, 2009	12/M	GEJ	Poor	Lung	Neo-adjuvant chemotherapy[e]	9	DOD	Patient refuses surgery after tumor progress under chemotherapy
Issaivanan, 2012	18/M	GEJ	Poor	Liver, lymph node	Neo-adjuvant chemotherapy[f]	6	DOD	Tumor progress under chemotherapy

M = male, F = female, GEJ = Gastroesophageal junction, TE = tracheo-esophageal, EA = esophageal atresia, ALL = acute lymphocytic leukemia, DOD = died of disease, NED = no evidence of disease.

[a] Chemotherapeutic agents not specified.

[b] 5-fluorouracil, adriamycin, mitomycin C (6 cycles).

[c] Etoposide, doxorubicin, cisplatin.

[d] Methotrexate, 5-fluorouracil, cisplatin, etoposide, paclitaxel.

[e] 5-fluorouracil, cisplatin (8 cycles).

[f] Cisplatin, irinotecan (4 cycles) then capecitabine, docetaxel.

Appendix B. Table B
Esophageal squamous cell carcinoma in children and adolescents under the age of 21 reported in the literature.

Author/year	Age/sex	Esophageal location (in thirds)	Histologic differentiation	Metastasis	Therapy	Follow-up period (months)	Follow-up status	Comments
Kaufmann, 1896	21/F	Proximal	Not noted	Not noted	Tumor resection	Not noted	Died	Death secondary to aspiration pneumonia
Kinnman, 1968	15/M	Proximal	Well	No	Temporary gastrostomy	0	Died	Lye ingestion at the age of 3, death secondary to tumor tracheo-esophageal fistula and bronchopneumonia
Oberiter, 1976	12/F	Proximal	Not noted	Lymph node	Radiotherapy	6	DOD	Tumor unresectable
Singh, 1979	14/M	Middle	Not noted	Lymph node	Palliative gastrostomy	Not noted	DOD	Tumor unresectable
Soni, 1980	8/F	Middle	Well	Lung	Radiotherapy[a]	Not noted	Not noted	Tumor unresectable, transient tumor regression after irradiation
Dewar, 1988	20/F	Middle	Not noted	Not noted	Not noted	Not noted	Not noted	
Shahi, 1989	14/M	Proximal	Well	No	Radiotherapy[b]	0	AWD	Excellent response to radiotherapy, patient did not return for surgery
Schettini, 1989	11/F	Proximal	Not noted	Not noted	Esophagectomy with gastrostomy and cervical esophagostomy	3	DOD	Possibly caustic injury with one year of age, R1 resection and rapid tumor recurrence
Kumar, 1992	18/F	Middle	Well	No	Neo-adjuvant radiotherapy,[c] total esophagectomy, esophagogastrostomy	18	NED	
	16/F	Distal	Poor	No	Neo-adjuvant chemotherapy,[d] radiotherapy,[c] total esophagectomy, esophagogastrostomy	14	DOD	Poor response to chemotherapy, local recurrence after 14 months
	14/M	Proximal	Well	No	Radiotherapy[b]	6	Lost to follow-up	
	18/M	Middle	Poor	No	Chemotherapy[d]	Lost to follow-up	AWD	Excellent response to chemotherapy, patient did not return for radiotherapy
Aryya, 1993	10/M	Distal	Well	Not noted	Not noted	Lost to follow-up	Not noted	Patient did not return for radiotherapy
Karwasra, 1999	17/M	Distal	Moderate	Lymph node	Esophagectomy, esophagogastrostomy	6	NED	
Allam, 2000	15/F	Distal	Well	No	Esophagectomy and proximal gastrectomy, esophagogastrostomy	9	NED	
Semnani, 2005	20/M	Middle	Not noted	Not noted		0	Died	Died of cardiac arrest during surgery
Tampi, 2005	15/M	Distal	Well	No	Ivor Lewis esophagectomy, adjuvant chemotherapy[e]	20	NED	Esophageal HPV-16 infection
Singh, 2010	16/F	Distal	Well	No	Partial esophagectomy and proximal gastrectomy, esophagogastrostomy	14	NED	Gastrostomy at age of 8 for trichobezoar removal
Hedawoo, 2010	15/M	Distal	Well	No	Partial esophagus resection, fundus resection, partial diaphragm resection, gastric tube formation	Not noted	NED	
Jain, 2010	14/M	Proximal	Not noted	Lymph node	Radiotherapy[f]	5	Not noted	
Issaivanan, 2012	14/M	Distal	Moderate	Lung, liver	Neo-adjuvant chemotherapy,[g] esophagectomy with primary anastomosis	9	DOD	Tumor progressed on chemotherapy and after surgery

M = male, F = female, GEJ = gastro-esophageal junction, EA = esophageal atresia, ALL = acute lymphocytic leukemia, DOD = died of disease, NED = no evidence of disease, AWD = alive with disease.
[a] Tele-cobalt.
[b] 7000 cGy (35 fractions).
[c] 2500 cGy (5 fractions).
[d] Cis-platinum, methotrexate (2 cycles).
[e] Paclitaxel, 5-FU, cisplatin (4 cycles).
[f] No other treatment was specified.
[g] Paclitaxel, carboplatin (4 cycles).